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Appendicitis and Tuberculosis.—Tuberculous appendicitis is relatively rare but pyogenic appendicitis occurs not uncommonly in cases of pulmonary tuberculosis. In the past 10 years, 7 cases of tuberculous appendicitis occurring in patients unsuspected of having tuberculosis were operated upon in the University of Michigan Hospital. Of these 7 cases (5 recurrent, one ruptured appendix with abscess formation, and one acute) none offered any criterion for preoperative, or local, diagnosis of tuberculous pathology. Further study evoked by the surgical specimen reports revealed two cases of pulmonary tuberculosis. Nitrous oxide and oxygen (2 cases), plus ether (5 cases), anaesthesia caused no postoperative complications. Four of the patients having pulmonary tuberculous appendicitis have been followed and found to be well seven, three, one and one-half, and one year, respectively, after operation. One of the 2 pulmonary cases is still under sanatorium care 5 years later but making satisfactory progress while the other one, four years later, is well and has a healthy child. A study was also made of 20 patients who required appendicectomy while under treatment for pulmonary tuberculosis. The clinical course and physical finding in these 13 acute and 7 recurrent cases were those usually found but the leucocyte count was uniformly 16,000 or more, regardless of the duration of symptoms. Among the 6 cases of tuberculous (30 per cent) and the 14 cases of pyogenic appendicitis the acute form occurred twice as frequently as the recurrent. The immediate postoperative pulmonary condition remained satisfactory; 8 had ether in combination, 3 no aspiration anaesthesia, and the rest nitrous oxide and oxygen alone and in combination. One patient later developed pneumonia and thrombophlebitis, 6 had wound infections, and none had faecal fistulae. Five of those having tuberculous appendicitis are now dead and the other one is doing poorly under sanatorium care more than 3 years later. On the other hand the pyogenic group comprises 5 arrested cases, 5 making satisfactory progress in a sanatorium, 1 dead of pulmonary disease, 1 died during a third stage thoracoplasty one year later, and 2 unaccounted for. Tuberculous appendicitis is most likely to occur as a complication of advanced, uncontrolled pulmonary disease and the prognosis is extremely grave. Appendicectomy to remove a tuberculous focus is not warranted. However, the prognosis is good in pyogenic appendicitis in cases of pulmonary tuberculosis and in tuberculous appendicitis with unsuspected or no pulmonary tuberculosis. Immediate operation should be done in acute appendicitis and selective operation in recurrent appendicitis in the presence of pulmonary tuberculosis since the operative mortality is not increased over that in nontuberculous patients. —*Primary Tuberculous Appendicitis and Appendicitis Complicating Pulmonary Tuberculosis, E. T. Theime, Amer. Jour. Med. Sc., May, 1937, cxciii, 700.*—(*E. M. J.*)

Tuberculous Meningitis.—Until some years ago it was thought that tuberculous meningitis usually followed the haematog-

enous dissemination of tubercle bacilli from some focus in the body. Recently, however, a series of cases of this disease has been reported (Rich and McCordock) in which a ruptured tubercle adjacent to the subarachnoid space or ventricular cavity was believed to have been responsible for the infection of the cerebrospinal fluid in 75 out of 82 cases. Contrary to this report Ragins, in an investigation of 39 cases of tuberculous meningitis, found indications in only 7 cases that older caseous lesions in the brain and meninges had caused the diffuse meningeal infection. Also, Kment examined the choroid plexus in 27 cases of tuberculous meningitis and found tubercles in 60 per cent. The material that forms the present study consisted of 30 brains, 28 of which were the seat of tuberculous meningitis and 2 of tuberculoma. These brains were examined by gross and, for certain areas, microscopical section: Certain of the cases exhibited collectively some common pathological features, permitting the arrangement into 5 groups as follows: *Group I:* This consisted of 14 cases showing a diffuse, exudative tuberculous meningo-encephalitis without tubercles in the cerebral substance. *Group II:* This consisted of 3 cases displaying, in addition to the diffuse tuberculous meningo-encephalitis, a few solitary tubercles in the cerebral substance that were not in contact with either the ventricular lining or the subarachnoid space. *Group III*: In this division were collected 6 cases, which resembled group II except that the tubercles in the cerebral substance were in contact with the leptomeninges. *Group IV:* This consisted of 5 cases which, together with a diffuse meningo-encephalitis, presented numerous cortical and subcortical tubercles. The great number of tubercles present suggested that they were the result of direct blood-stream dissemination. *Group V:* Two cases of tuberculoma in contact with the ventricular lining or leptomeninges without meningitis. The evidence presented shows that in all cases of tuberculous meningitis there was an extension of the inflammatory process into the cortex resulting in foci of encephalitis, which varied in degree from perivascular infiltration to tubercle formation. In a few cases solitary tubercles were found but these were not in contact with the ependyma or leptomeninges. When tubercles occurred in great numbers they were due to direct haematogenous dissemination. Large solitary tuberculomata occurred with or without meningitis. In only 6 cases in this series were cortical tubercles demonstrated which might have been responsible for the coexistent meningitis. In 11 cases the choroid plexus disclosed the presence of tubercle formation. The blood vessel changes which were observed during the course of study revealed no findings that differed from those already described by other observers.—*Tuberculous Meningitis and Its Relation to Tuberculous Foci in the Brain, D. Beres & T. Mellzer, Amer. Jour. Path., January, 1938, xiv, 59.*—*(J. S. W.)*

Tuberculosis of the Larynx.—The functional disability of the larynx does not necessarily bear a direct relationship to the amount of involvement of this organ. Because of this fact serious tuberculosis of the larynx may be overlooked for many weeks or months by the physician who waits for symptoms to develop before investigating the condition of the larynx. In this respect tuberculosis of the larynx is not unlike pulmonary tuberculosis. In general, involvement of the larynx tends to accompany large exudative episodes in the lungs, but when the latter subside the laryngeal process may or may not do likewise. In unilateral pulmonary tuberculosis homolateral laryngeal involvement is common enough, but this is not the rule. A case of bilateral ulcerocaseous pulmonary tuberculosis with a fatal prognosis was seen with symptoms of aphonia, and dysphagia of six months' duration. For eight days there had been difficulty in swallowing liquids. This act would be followed by coughing and severe choking. The epiglottis was swollen and perforated. There was no evidence of syphilis. Tuberculin 1:100 was injected about the perforation with the result that swallowing of liquids was again readily performed. After six weeks an even larger perforation appeared. The treatment was repeated with a similar remission of symptoms, and closure of the opening was maintained until exitus a few weeks later. In this instance the initial dose of tuberculin was probably too large and the local reaction had led to caseation. The authors feel that this application of a treatment that they have found successful in dealing with pleural fistulas is a rational one. The second case was also one of extensive bilateral pulmonary tuberculosis in which death resulted from haemoptysis. The patient complained of dysphonia and dysphagia at the time the larynx was examined, but no abnormality could be seen. At necropsy there was found a tuberculous ulcer just below and parallel to the right vocal cord. The inflammatory reaction was not localized but had spread under the mucosa to the vocal cord and to the right *plica ventricularis*. The third case reported is one of early bilateral apical tuberculosis. Symptoms of involvement of the larynx were completely absent, but examination of that

organ revealed the presence of an ulcer just above the left vocal cord, and another on the left *plica ventricularis*. Three months after this observation and simultaneously with a spread of the pulmonary process aphonia developed. The left vocal cord itself was never involved. At necropsy there was found beneath an intact mucous membrane a large caseous nodule which had involved the left thyreoarytenoid muscle. Laryngeal tuberculosis may lead to obstruction of the air passage by the production of two types of lesion. The first a massive pseudo-oedematous infiltration can be successfully treated by means of the galvanocautery properly applied at eight-to-fifteen-day intervals. The second type is a perichrondritis with ankylosis of the cricoarytenoid joints. It is best treated with ultraviolet radiation followed by painting with lactic acid or zinc chloride. Such procedures are successful only when employed in the absence of all congestive processes in the respiratory tract, and during a definite remission in the laryngeal tuberculosis.—*Quelques cas de tuberculose laryngée, G. Derscheid & P. Toussaint, Arch. méd. chir. de l'app. resp., 1937, xii, 234.*—(*C. L. D.*)

Tuberculous Tracheobronchitis.—The term specifies a certain mucosal and submucosal infection of the trachea or large bronchi. The lesion may be ulcerative, nonulcerative, hyperplastic or fibrostenotic. It is probably almost always secondary to active pulmonary tuberculosis. Most of the symptoms are not pathognomonic of specific infection but are based upon a reduction in size of the lumen somewhere in the air passages. The most common symptom is wheezing or rattling. Asthmatoid breathing frequently occurs in attacks. There may be persistent audible and palpable parasternal rhonchus. Sudden elevation of temperature in an otherwise normal course may be the first sign. There may be paroxysms of cough with difficulty in raising sputum, or dyspnoea and intermittent cyanosis in spite of an apparently adequate vital capacity. The sputum may be large in amount, exceptionally tenacious, contain fibrin plugs or bronchial casts, and its purulent content is not necessarily high. X-ray signs are few. In serial films, intermittent areas of atelectasia are significant and occasionally tracheal or bronchial narrowing may be visualized. Four types of lesions are noted, any two of which may coëxist. Bronchoscopically the nonulcerative nonstenotic type appears as submucosal infiltrations with occasional discrete tubercles with a congested, granular, oedematous overlying mucosa that bleeds easily. In the hyperplastic type, there is an alteration in the contour of the trachea or stem bronchi, often decreasing the diameter, by submucosal proliferation and piling up of tissue. In the ulcerative type, there is grossly visible diffuse or circumscribed loss of mucosa. The ulcers are rarely solitary. In the fibrostenotic type, obstruction is due primarily to intrinsic endobronchial scar formation. It may be sharply localized or be one or more centimetres in length. In differential diagnosis must be considered: nonspecific inflammations and ulcers, erosions of lymph nodes, neoplasm, syphilis, rhinoscleroma, asthma and certain extrabronchial conditions. In the past six years the diagnosis has been made in over 50 cases. Twenty-four cases have been followed more than one year or until death. Seventeen had gross ulcerative disease, fibrostenosis or both. Nine are now dead and none of the others have returned to complete health. There is no evidence that collapse therapy encouraged the development of tuberculous tracheobronchitis. Results, with regards to these lesions, have been equally poor whether the patient received bed-rest or collapse therapy. Seven of the 24 cases had nonulcerative nonstenotic type lesions. None are dead and 4 have closed cavities and negative sputum following thoracoplasty. It is as yet impossible to predict their course. At present bronschoscopic treatment appears to offer the best possibilities for symptomatic relief. Chemical shrinkage of the oedematous mucosa may give relief for many months. There is no set rule for treatment of cicatricial obstructive lesions. Some success has been had on ulcerative lesions with high frequency electrocauterization. Roentgen radiation has caused improvement in a few cases. It might be wise for all candidates for major surgical collapse to have the benefit of preoperative bronchoscopic examination.—*Diagnosis, Treatment, and Prognosis in Tuberculous Tracheobronchitis, P. C. Samson, Jour. Thoracic Surg., June, 1937, vi, 561.*—(*L. F. B.*)

Tuberculous Pericarditis.—Over an 11 year period 42 patients have been observed, in 24 of whom the diagnosis was proved and in 18 of whom it was strongly suspected. A total of 1,653 autopsies were performed during this time at the Vanderbilt University Hospital. The cases may be divided into: 6 cases of active tuberculous constrictive pericarditis on whom pericardiectomy was performed, 7 cases in whom tuberculous pericarditis was the chief cause of death, 9 cases where pericarditis was a contributing cause of death, and 18 cases in whom tuberculous pericarditis was strongly suspected. Patients in the first group had been sick

months rather than years and with one exception were more than 40 years old. Chief complaints were dyspnoea on slight exertion and cough. All the patients had prominent veins, elevated venous pressure, paradoxic pulse, low pulse pressure, distant heart sounds, a fixed heart with little or no visible pulsation under the fluoroscope, enlarged liver, pleural effusion, and ascites. Three of the six patients are cured or greatly improved, 2 of whom have returned to active work. The remaining 3 cases are dead, 2 of miliary tuberculosis and one shortly after operation. The patients in group 2 were all males and over 40 years old. Symptoms were similar and all are dead. In 2 cases drainage of the pericardium had been done and large quantities of slightly bloody fluid removed. In group 3, age varied from 2 to 60 years and seven of the 9 were males. Duration of illness varied from 2 weeks to two and one-half years. All the patients in this group are dead. In group 4, age varied from 20 to 60 years, and 15 of the 18 were males. Symptoms and findings varied more than in the previous groups. Nine patients in this group are dead, 2 totally incapacitated and 3 partially so. The remainder are symptom free and there is some doubt as to the correctness of the diagnosis. Among the 42 cases, 86 per cent were males, 25 were white and 17 colored. Age ranged from 2 to 60 years, with an average of 40.3 years. The pericardium may be infected by way of the blood-stream, through the lymphatics and by direct extension. By the first method death usually appears before the pericarditis has progressed greatly and infection by direct extension is probably quite uncommon. It seems very likely that in most instances pericarditis is due to extension of the infection through lymphatic channels from a mediastinal focus. The course of the disease may be divided into an acute fibrinous stage, effusion and moderate thickening of the pericardial surfaces, and disappearance of the effusion with great thickening of the pericardium and epicardium. Treatment in the first stage consists of bed-rest and narcotics for the relief of pain. It is probably not advisable to perform frequent aspirations except for the relief of dyspnoea or evidence of marked congestion and not during the acute stage. When the process has become inactive and evidence of cardiac compression persists it is agreed that the scar should be removed.—*Tuberculous Pericarditis, A. Blalock & S. E. Levy, Jour. Thoracic Surg., December, 1937, vii, 132.*—(*L. F. B.*)

Diverticula of Pericardium.—This condition results from adhesive pericarditis walling off a pocket of fluid which increases in amount. Most of the relative clinical, physical, and laboratory findings are illustrated in the two following cases. The first was a 12 year old boy who had pericardial effusion and was tapped 5 times. X-ray showed a bilateral globular cardiac enlargement plus an 8 cm. semicircular shadow overlapping the upper right cardiac contour giving a cardiac transverse diameter of 24.1 cm. while that of the chest was 26.8 cm. Some pain continued and 2 years later he had fever, blood-pressure of 110/70, venous pressure of 12.5 cm. of water, little cardiac enlargement to the left, but along the entire right cardiac border was a marked protrusion which, being twice as wide at the base and separated from the heart by a sharp indentation, had a pendulous appearance. An oblique view localized it on the right anterolateral surface. There was no pulsation but it became longer and narrower on inspiration. The shadow of the superior vena cava appeared to be enlarged. Pericardiotomy revealed a walled off cavity containing 300 cc. of thick yellow pus which contained Much's granules. The wall was 5 mm. thick and composed of dense fibrous connective tissue infiltrated with some polymorphonuclear leucocytes and many lymphocytes. His general condition improved, fever subsided and venous pressure was 4 cm. Two years later the size of the sac showed little change but calcification had started. The other patient was a 48 year old man who had had a soft fluctuating, nontender, rounded mass to the right of the sternum, substernal discomfort, dyspnoea on exertion, palpitation, and occasional dizziness for about 5 years. The mass pulsated with the heart and could be partially reduced. X-ray showed left cardiac enlargement filling out the incisura while on the right there was a 14 by 12 cm. ovoid shadow overlapping the heart. Aspiration of the mass yielded 180 cc. of orange-red fluid which contained tubercle bacilli. Air injected could be seen in both the external and pericardial sacs on a lateral film. Autopsy, about a year later, showed a pericardial abscess cavity containing 350 cc. of cloudy, brownish fluid while most of the remaining pericardium was adherent and calcified. The external sac extending through an eroded cartilage contained 5 cc. of similar fluid. In differential diagnosis, cardiac aneurysm may be of a similar size and shape but is usually on the left side; mediastinal tumors are usually situated in the upper mediastinum; aortic aneurysm offers difficulty but the normal size of the remaining aorta, the pendulous appearance of the sac, and the clinical symptomatology will usually denote a pericardial diverticulum; and lung tumors are rarely as

sharply defined and are localized by lipiodol. —*Inflammatory Diverticula of the Pericardium (Encapsulated Pericardial Effusion), E. Freedman, Amer. Jour. Roentgenol., June, 1937, xxxvii, 733.*—(*E. M. J.*)

Tuberculosis of Pericardium.—Twenty cases of tuberculosis of the pericardium are reported; of this number, eighteen died and two survived. Most of the patients were over forty years of age. Seven cases had large amounts of fluid in the pericardial sac; thirteen showed a thick fibrinous exudate (1 to 3.5 cm. thick); in only one case was there appreciable calcification. Eleven of the patients had tuberculosis of the mediastinal lymph nodes; three had tuberculosis of the lungs; seven had tuberculous pleuritis; and one each had tuberculosis of the peritoneum and epididymis. Fever was the most commonly associated symptom and in many cases oedema and anasarca were found. The blood-pressure was usually below normal; cardiac compression is associated with gradually declining arterial blood-pressure, small pulse pressure and rising venous pressure. The outstanding physical signs are an increase in the transverse diameter of the heart, signs of pericardial effusion, pericardial friction rub, and a feeble apex beat. Patients suffering from tuberculosis of the pericardium may be classified in the following groups: (*1*) Elderly patients showing signs and symptoms of wasting disease with obscure fever. These individuals should be carefully studied to rule out tuberculosis of the pericardium. (*2*) Patients with signs and symptoms of cardiac insufficiency. (*3*) Those who have multiple serous membrane tuberculosis. (*4*) Patients with massive pericardial effusion and, (*5*) those suffering from miliary tuberculosis with involvement of the pericardium. The determination of the venous pressure in both upper and lower extremities is important in diagnosis since a general elevation in venous pressure regularly accompanies pericardial disease. The best therapeutic efforts are surgical; aspiration should be performed when there is a drop in systolic blood-pressure, a rise in venous pressure and signs of venous stasis.—*Tuberculosis of the Pericardium; a Study of Twenty Cases, C. S. Keefer, Ann. Int. Med., February, 1937, x, 1085.*—(*A. A. E.*)

Pleurisy with Effusion.—It is highly probable that dry pleurisy and pleurisy with effusion are manifestations of the same process. Pleurisy is ordinarily a manifestation of the activity of the tubercle bacillus and this is the only safe viewpoint to take. In pleurisy with effusion there is inflammation of the pleural membrane with fibrin deposit, also present to a lesser extent in dry pleurisy. In the more severe pleurisies the inflammatory changes are intensified with final destruction of the pleural membrane and alteration of function. The character of the fluid present is either a clear straw-colored serous effusion or occasionally turbid, the predominant cell in the common form being the lymphocyte. Effusions of this character occur in a considerable proportion of tuberculous patients receiving artificial pneumothorax and are probably of similar nature, especially as they are usually accompanied by fever. These fluids are ordinarily sterile in the sense that no organisms can be demonstrated by ordinary bacteriological methods, but guinea-pig inoculation results in tuberculous lesions in a considerable proportion, and this is probably also true for those complicating pneumothorax treatment. These latter tend to persist longer than simple effusions and the presence of air may tend to retard their absorption. In many cases of effusion the presence of an associated pulmonary tuberculosis can be demonstrated either by the presence of tubercle bacilli in the sputum or by X-ray examination. In about 60 per cent, however, clinical pulmonary tuberculosis does not manifest itself and the association is only inferred. Pressure, as exerted by an effusion, is a function of its weight. It is possible that, with the ordinarily low pressure in the great veins, the presence of an incompressible mass near them on the right side is a source of danger, or even sudden death. Likewise, the presence of fluid in one side of the thorax diminishes the elasticity of that lung and results in some mediastinal deviation. The collapse of the lung seems less due to direct compression than to its immobilization. The incidence of the disease is chiefly in persons of 20 to 40, and is twice as frequent in males as females. The commonest initial symptom is a chill. Fenton regards simple pleurisy, either dry or with effusion, as comparable to incipient pulmonary tuberculosis. The modes of onset are acute, with sudden pain, dyspnoea, fever and malaise; or subacute with intermittent pain, cough, slight malaise or pyrexia; or insidious, with prolonged malaise of long duration and slight pain. The physical signs may be misleading. Breath-sounds are commonly but not invariably diminished. Sometimes consolidation is suggested. These signs probably are associated with complete lung collapse, tubular breathing being transmitted; with partial collapse one gets diminished or suppressed breathing. It should be recalled that physical signs indicate only the physical condition of underlying viscera. Most important are

probably absence of vocal fremitus and stony dulness and resistance on percussion. Cases of massive pulmonary collapse may also be associated with fluid in the pleura. The signs are those of consolidation with visceral displacement toward the affected side. If a satisfactory diagnosis is in doubt, a small amount of fluid should be withdrawn for cytological examination and culture. Recovery with absorption occurs usually in four or five weeks if the amount is not large. Temperature subsides by lysis. Some impaired resonance and diminished breath-sounds persist longer. In children and adolescents institutional care is usually advisable. Dry pleurisy requires temporary rest and relief of pain but strapping the chest is not advised because of various disadvantages, neither is induction of pneumothorax. Aspiration is advisable in cases of effusion which persist or are excessive or cause functional disturbance. Gas replacement is not advised unless there is evidence of manifest pulmonary tuberculosis. The dangers of aspiration may be avoided by not pushing too far and by stopping at any untoward symptoms. If a large amount must be withdrawn, gas replacement should be used. —*Simple Pleurisy with Effusion, W. J. Fenton, Tubercle, May, 1937, xviii, 337.*—*(A. P.)*

Contralateral Pleurisy.—The authors report a case of pulmonary tuberculosis with a large cavity in the right upper lobe of the lung for which a right pneumothorax was induced. Simultaneously with the development of a pleural effusion on the left side a remarkable reduction in the size of the cavity occurred. Within twenty days the cavity had entirely disappeared and has remained so for well over a year. As the effusion subsided the patient made rapid gains in his general condition and his sputum no longer contained acid-fast bacilli. There seems to be no reason for believing that mechanical factors aided this remarkable improvement. As the effusion lasted only six weeks it is unlikely that cicatrization could have taken place so rapidly. It is scarcely probable that a contralateral effusion would alter the neuroconstrictor reflexes in any way. Therefore it seems most likely that this phenomenon was the result of biological action probably of an allergic nature. In 1913 von Muralt published observations on four cases with homolateral pleurisies and offered a similar explanation for the sudden recession of the parenchymatous lesions. In the present case there were small but undeniable lesions appearing to lie just beneath the pleura of the left lung. It is possible that the right pneumothorax upset the biological equilibrium of these lesions and thus precipitated the effusion. The fluid was free from tubercle bacilli, contained mostly lymphocytes, and was serofibrinous. This, plus the fact that it persisted for only six weeks, would speak for its appearance being the result of a hyperergic reaction. After the left sided pleural effusion had disappeared and while pneumothorax was being maintained on the right, there was a brief febrile episode accompanied by a very slight serofibrinous effusion of similar nature on the homolateral side. This episode was likewise followed by a great amelioration in the patient's condition. Thus, whereas pleurisies are usually dangerous and at times fatal complications, they may occasionally produce in the organism a favorable modification in the local and general defense mechanisms.—*Action favorable, sur les lésions parenchymateuses, d'un épanchement controlatéral au cours du pneumothorax thérapeutique, E. Sergent, M. Fourestier & M. Franchel, Arch. méd. chir. de l'app. resp., 1937, xii, 135.*—*(C. L. D.)*

Calcification of the Pleura.—At Sea View Hospital ten cases of calcification of the pleura have been discovered in three years, during which time approximately ten thousand patients were examined by means of roentgenograms of the chest. Since eighty per cent of these patients had pulmonary tuberculosis, pleural calcification is a rare concomitant of pulmonary tuberculosis. Caseating tuberculosis of the pleura seems to be the most common aetiological agent in these cases. Only one of the ten patients was a female and there was no history of previous chest injury in any of the patients.—*Calcification of the Pleura, H. K. Taylor & S. Schwartz, Quart. Bull. Sea View Hosp., October, 1937, iii, 65.*—*(A. A. E.)*

Tuberculous Empyema.—The production of purulent exudate in the pleural cavity, or the changing of existing clear effusions to purulent ones, is always due to the development of pleuropulmonary fistulae. The fistulae may be divided into 3 sizes: punctiform, less than 0.5 mm.; small, less than 1 mm.; and large, 1 to 10 mm. or more. This division was based upon data obtained by analysis of the air contained in the pneumothorax space. In the absence of fluid the oxygen is about 3 to 4 per cent and the carbon dioxide about 6 per cent. When straw-colored fluid is present, oxygen drops to between 1 and 2 per cent and carbon dioxide rises to between 6 and 8 per cent. When purulent fluid is present, oxygen is less than 1 per cent and carbon dioxide is about 8 per cent. Depending upon the

size of the fistula, the pleural cavity will communicate with the alveolar spaces or larger bronchi, and the percentage of oxygen in the pneumothorax air will increase while the percentage of carbon dioxide will be decreased. The composition of alveolar air is oxygen 15 per cent and carbon dioxide 6.0 per cent; of atmospheric air, oxygen 20.7 per cent and carbon dioxide 0.03 per cent. By gas analysis of the pneumothorax air the size of the fistulae may be determined and a more accurate prognosis established. Prognosis for small punctiform fistulae is rather good, many of the fistulae closing spontaneously. For moderate sized fistulae, prognosis is worse since spontaneous closure is unlikely and the development of a mixed infection highly probable. Tuberculous empyemata may be classified as those with negative sputum, those with positive sputum, and those with mixed infection. For the last group, immediate drainage should be done with mechanical and chemical disinfection of the cavity to put the patient in condition to stand thoracoplasty. For the second group, immediate thoracoplasty is advised. In the group with negative sputum treatment depends upon the presence or absence of patency and the size of the bronchial fistulae.—*A New Conception of Tuberculous Empyemata Based on Their Pathologic Physiology, P. N. Coryllos, Jour. Thoracic Surg., October, 1937, vii, 48.*—(*L. F. B.*)

Miliary Calcification in the Spleen.—Calcifications are seen occasionally as incidental findings in roentgenograms of the chest and abdomen. Aetiological factors are numerous but among these may be primary tuberculosis of the spleen as found in young adults. In this condition splenomegaly associated with large granular calcifications constitutes a pathognomonic picture. The usual type of calcification seen is the multiple miliary form showing in the X-ray as numerous rounded densities one to eight millimetres in diameter and averaging three to five millimetres in diameter. Phleboliths and tubercles are the most common causes; many feel that most are the end results of healed miliary tubercles and possibly, therefore, too much importance has been attached to the X-ray findings. Eighteen new cases are reported. Three of these showed quiescent adult-type tuberculosis and one had calcified Ghon's tubercles in the right lung. The pathological and roentgen findings are presented in three of the cases which came to autopsy. Two of these had calcified primary tuberculous lesions in the lungs. Histological examination of all three showed the splenic calcification to be phleboliths. Roentgenologically no distinguishing characteristics could be found between phleboliths and calcified tubercles. The conclusion is reached that the great majority of miliary calcifications of the spleen are phleboliths and the presence of a calcified Ghon's tubercle does not necessarily indicate a tuberculous origin. Only when there is evidence of tuberculosis elsewhere in the body or a calcified Ghon's tubercle is present in a child may the splenic calcifications be considered tuberculous in nature.—*Miliary Calcifications in the Spleen, T. M. Berman, Radiology, July, 1937, xxix, 37.*—(*G. F. M.*)

Tuberculosis of Abdominal Lymph Nodes.—This paper is based on a study of a series of 239 consecutive cases admitted in the Aberdeen (Scotland) Royal Infirmary during the ten year period 1923 to 1932, of whom 207 were traced and 118 later examined. There were 38 patients with caseous mesenteric lymph nodes who were operated on and Carson favors this as less dangerous than leaving them. The caseous type was usually associated with comparatively recent symptoms—weeks or months rather than years. Abdominal pain was always first and usually in the right iliac fossa; however, it was often generalized or originally periumbilical and occasionally felt in the back or leg, not influenced by exercise. The attacks tended to become more severe and often associated with nausea and vomiting. Some abdominal tenderness was fairly constant, usually in the right iliac fossa, and a mass was palpable in 8 cases. Fever was present in the younger and more acute cases and appeared earlier than with appendicitis. Of 18 cases X-rayed, 11 showed suggestive areas of calcification. The condition must be differentiated especially from acute or subacute appendicitis. Of the 38 cases, 18 showed evidence of recent involvement of the appendix and Morley Fletcher has described an acute localized ileocaecal form of tuberculosis, advising removal of both appendix and lymph nodes. Of 15 cases examined microscopically, however, none showed evidence of tuberculosis of the appendix. Localized plastic peritonitis and perforation of caseous nodes are common, with later disability from adhesions. It is well to excise all the larger and caseous nodes and any calcareous ones likely to lead to trouble. In some cases evacuation with a spoon or scoop must be resorted to. Sunlight, either natural or artificial, and vitamin D should be given, although there is some evidence that congestive reactions from irradiation may occur about caseous glands. Milk is the best calcium containing food. It is assumed that most infected nodes due to

tuberculosis are well on the way to calcification within a year. However, cycles occur and the two types of lesion often coëxist. Natural cure by spontaneous calcification must occur in many cases. Extensive involvement probably affects fat absorption and leads to wasting. Symptoms relate chiefly to abdominal pain, dragging or colicky, sometimes radiating to back and thigh, aggravated by fatigue, sometimes with nausea and vomiting. However, there may be no symptoms. X-ray examination of the abdomen is usually conclusive but the calcifications must not be confused with phleboliths, enteroliths or ureteral and renal calculi. As to results, 166 cases were operated on, but 35 required reoperation. These were cases with either persistent discomfort or extensive involvement or complications, such as adhesions.—*Tuberculous Disease of the Abdominal Lymphatic Glands, G. H. Colt & G. N. Clark, Lancet, January 16, 1937, ccxxxii, 125.*—(*A. P.*)

Treatment of Abdominal Tuberculosis.—There has been a decrease in the number of cases with involvement of the mesenteric lymph nodes and of the peritoneum, there being 750 deaths from these causes in 1935 as compared with 4,345 in 1910. Complete abolition of bovine tuberculosis is not probable, but the compulsory pasteurization of all milk would further reduce the incidence. A bland, low-ash diet, consisting mainly of dairy products and a minimum of vegetables unless sieved, is recommended. Heliotherapy is of great value. In early and mild stages of tuberculous mesenteric adenitis, surgery is not indicated except to establish a diagnosis. If laparotomy is done it is desirable to remove the appendix and any other obvious focus. Simple laparotomy appears to start often a healing process. In early peritonitis with ascites, nonsurgical treatment is indicated. Complete rest with general hygienic measures secure good results. Here also, improvement in the condition is often stimulated by laparotomy. No experience has been had with pneumoperitoneum.—*The Treatment of Abdominal Tuberculosis, A. Moncrieff, Jour. State Med., September, 1937, xlv, 551.*—(*L. F. B.*)

Surgical Treatment of Tuberculous Cervical Adenitis.—Some recent publications have painted a very gloomy picture of these results, for example, Brian Thompson, who found a large proportion of patients operated on had recurrence and persistent sinuses, as well as bad scars. Barrington-Ward has checked this with his own experience at the Hospital for Sick Children, Great Ormond Street, London, over a period of years. He has been able to trace 95 of 133 consecutive patients, all children, subjected to radical excision, and personally examined 89. He considered the mortality, permanence of cure, and presence of any deformity or scar. There was no operative mortality and 94 of the 95 patients were living and well, one having died of an acute infection. Barrington-Ward has never seen generalized tuberculosis follow excision of tuberculous lymph nodes, but in two instances has seen meningitis follow the scraping of a sinus. Only one patient needed further treatment although 11 had slightly enlarged nodes appear in a different part of the neck. All were in good health. In no case was there any nerve injury. Scars were classified as good in 65 cases, fair in 20 and poor in 4, all of whom had suffered from severe skin infection and sinuses before coming to operation. The average hospital stay was 22 days and three patients had a discharging wound after operation. Most of these nodes were caseous, 30 being complicated by abscesses and 10 by sinuses. The tonsillar node was usually first involved and the infection was assumed to be bovine in origin. Nonsurgical methods of treatment are relatively ineffective and consume long periods of time. The presence of discharging sinuses is to be considered a menace to both patient and community and proper dissection will practically always eliminate these. If there is an obvious focus of infection of the nodes-tonsils, adenoids, teeth, ears—it is itself attacked. Following operation the neck is splinted in mild cases and bed-rest or recumbency instituted in the more severe. Measures are taken to improve the general health and some glandular enlargements will recede and disappear under these. Any glandular enlargement persisting after three months of general treatment or showing softening or extension should be excised. Removal of a tuberculous node intact leaves an invisible scar and terminates the illness. If the nodes are already caseous, with abscess formation, excision is still best. Even a superficial abscess, without extensive skin involvement, is no contraindication. Removal of all underlying nodes will effect a speedy cure. However, the operation requires skill and thoroughness, good anaesthesia, good light and adequate assistance. Thus performed it is one of the most satisfactory surgical operations.—*Tuberculous Glands of the Neck in Children, L. Barrington-Ward, Lancet, April 24, 1937, ccxxxii, 980.*—(*A. P.*)

Tracheobronchial Tuberculous Adenopathy.—The authors report two instances

of massive tuberculous involvement of the tracheobronchial nodes in adults developing after prolonged and intimate exposure to cases of fatal pulmonary tuberculosis. In one of these a positive tuberculin reaction was demonstrated before any signs of illness were present, at a time when the roentgenogram of the chest was entirely negative. Subsequently there developed large shadows in the right hilar region and extension of the lesions in the deep tissues under the clavicle. Biopsy of this latter node showed typical caseous tuberculosis. This node contained virulent tubercle bacilli of the human type. At the end of about a year of rest and treatment with the Boquet and Négre methyl antigen these nodes regressed completely.—*L'adénopathie tracheo-bronchique tuberculeuse pure de l'adulte allergique, E. Couland & J. Dugas, Rev. d. l. tuberc., December, 1936, ii, 1177.*—(*M. B. L.*)

Treatment of Tuberculous Adenitis.—There has been a marked decrease in the number of cases seen in children and young adults. Between 1909 and 1913, 240 children underwent treatment while between 1929 and 1933, only 18 such cases were seen and treated. Improvement in general hygiene, better housing, a better diet, and especially greater care over the milk supply are important factors in this decrease. There has been little change in the methods of treatment for many years, rest and conservatism receiving greatest emphasis. Ultraviolet rays, X-rays and injections have been tried but those types benefited by these were found to be those that also disappeared with only rest and hygienic measures. The first step in treatment is the removal of sources of infection such as bad teeth, enlarged or septic tonsils and adenoids and unhealthy conditions about the nose. Rest in as good climate and environment as possible is essential. If, following a period on this regimen, suppuration appears, a radical operation offers the best chance of rapid cure. Several weeks of rest following operation should be had and, if desirable, ultraviolet rays can be used.—*The Treatment of Tuberculosis of Lymphatic Glands, W. G. Sutcliffe, Jour. State Med., September, 1937, xlv, 497.*—(*L. F. B.*)

Tuberculous Cyst of Thigh.—*Case Report:* A case is reported of a painter 18 years of age, admitted to the University College Hospital, London, complaining of a lump in the upper thigh. Eight years before he had fractured the left femur and about six months later noticed the swelling which had gradually increased, with pain the last two years, worse at night and on lying down. There was no family history of tuberculosis and no constitutional symptoms. The patient was well formed but showed a tendency to bulging about the buttocks and thighs and lurched a little to the left when standing on that side. The left thigh showed on its lateral aspect a large smooth, tense fluctuant swelling extending upward toward the iliac crest, outward to the great trochanter and inward to the femoral vessels, projecting several inches beyond the normal outline of the thigh. The right thigh showed a similar and corresponding swelling extending well into the buttock, deep to the gluteus maximus, with fluctuation between thigh and buttock. Both hip joints showed considerable limitation of internal rotation. Roentgenographs showed only a small oval area of rarefaction in the left great trochanter, while films of the chest showed densely calcific hilar nodes and dense shadows in the right upper third of the lung field. The swelling of the left thigh was aspirated and a thick yellow sterile fluid containing cholesterol obtained. It was later explored and a large cyst discovered deep below the deep fascia extending backwards deep to the anterior border of the gluteus maximus and communicating by a narrow neck with a small abscess cavity in the great trochanter, lined by smooth sclerosed bone and filled with granulation tissue. The wound healed by first intention. Later the right thigh and buttock were explored and a similar cyst found, with a small abscess cavity below the insertion of the gluteus medius lined by granulations and lying over an area of bare bone. A portion of the cyst wall, excised and injected into a guinea pig, produced miliary tuberculosis. On microscopical examination the granulations were typically tuberculous, with an inner caseous layer. It is believed that the initial bone lesions were embolic and antedated the cystic accumulations in the soft parts.—*Bilateral Cystic Swellings of the Thighs of Tuberculous Origin, E. A. Devenish, Lancet, April 10, 1937, ccxxxii, 869.*—(*A. P.*)

Tuberculous Spine Lesions.—The usual site of a destructive lesion is the anterior part of the centrum. Two or three adjacent vertebrae may be simultaneously affected, the process appearing to spread up and down under the anterior common ligament. In certain cases, usually low thoracic or lumbar, the focus originates in the intervertebral disc, destroys the disc and the upper cortical plate of the centrum below as well as the lower cortical plate of the centrum above. About 20 such cases have been observed out of 470. Occasionally only the anterior half, one side, or the lower half of the centrum may be destroyed. Articular joints of the

spine are rarely involved, one case having been seen. Occasionally there is cavity formation with small sequestrae in the vertebral body. Tuberculous lesions originating in the spinous process were found in 3 cases. In 4 cases the lesion was situated between the head of the rib and vertebral centrum. At autopsy completely infiltrated vertebral centra were often found when previous X-ray films gave no evidence of disease.—*Unusual Locations of Tuberculous Lesions in the Spine, Z. B. Adams & J. J. Decker, Jour. Bone & Jt. Surg., July, 1937, xix, 719.*—(*L. F. B.*)

Tuberculosis of Knee.—From a review of the literature and from his experience with 147 patients with tuberculosis of the knee, the author concludes that best results are obtained by operative intervention. Adolescence and maturity are the most suitable ages for operation. Economic resection, in which no attempt is made to remove all foci of disease may successfully be done between the ages of 10 and 15 if care is taken not to injure the epiphyseal cartilages. The best time for ankylosis is the period of abatement of the process. The operation should be simple, aiming chiefly at ankylosis. Bone foci should be thoroughly curetted and filled with bone chips. No clamps, braces, wires, pegs, nor the "osteotomia medicata" operation should be used.—*Operative Treatment of Tuberculosis of the Knee Joint, S. Tregubov, Jour. Bone & Jt. Surg., July, 1937, xix, 734.*—(*L. F. B.*)

Roentgenography of Tuberculous Joints.—Bone shadows only are not particularly useful in differential diagnosis unless supplemented by soft-tissue shadows of effusion, swelling, infiltration, atrophy and so forth. In tuberculosis, effusions and soft-tissue abscesses tend to be as dense as adjacent muscle shadows, sharply outlined, and centered on the lesion or elongated in the planes of the involved tissue. A lesion is probably tuberculous when the characteristic expression of chronic and progressive development of effusion, soft-tissue atrophy, decalcification, and thinning of the cartilage space without productive calcification are present in degree and relation to each other to express the tendency to their chronic and progressive development. Data essential in making a diagnosis are duration of the lesion, previous treatment, age of patient, virulence of the lesion, and the presence of sinuses. There is no formula for the X-ray diagnosis of bone and joint tuberculosis and only when this information is properly applied to films demonstrating the soft tissue will the diagnosis of bone and joint lesions become efficient.—*Roentgenography of Tuberculosis of the Joints, A. B. Ferguson, Jour. Bone & Jt. Surg., July, 1937, xix, 653.*—(*L. F. B.*)

Treatment of Lupus Vulgaris by Hydnocarpates.—The obstinate nature of this disease is well known; therefore the encouraging results obtained by the use of the esters of hydnocarpus oil deserve attention. For some years leprosy workers have made increasing use of this method in treating cutaneous lesions and the analogy between leprosy and tuberculosis led Sir Leonard Rogers (1933) to introduce it in a case of extensive lupus vulgaris. Soon after his publication treatment was begun in the present series of 15 cases and Wallace issued preliminary reports in 1934 and 1935. Burgess, in 1935, reported on a series of 11 cases, 7 of whom were clinically cured and the others improved. Originally an ester of the total acids of hydnocarpus oil, consisting of both ethyl hydnocarpate and ethyl chaulmoograte, with some others, known as "moogrol," was used. Reactions at times were unduly severe and therefore, at the suggestion of T. A. Henry of the Wellcome Chemical Research Laboratories, it was abandoned in favor of phenyl-ethyl hydnocarpate, now marketed by Burroughs Wellcome and Company under the trade name of "eulykol." A small uncrystallizable portion of the total fatty acids has been eliminated and its irritant properties reduced thereby. Injections are made intracutaneously with an ordinary hypodermic syringe at weekly intervals, a series of wheals 0.5 to 1 cm. in diameter are raised in the lupus patches and nodules. The total amount injected at a sitting has not exceeded 1 cc. although Burgess has used as much as 5 cc. The wheals are spaced as far apart as possible and no area is injected a second time. Subcutaneous injection is to be avoided as it not only causes severe diffuse reactions but fails to produce the desired effect, lupoid foci being mostly in the corium and insulated by a layer of connective tissue from the subcutaneous tissues. No constitutional reaction has been noted and injections are practically painless but during the ensuing forty-eight hours there appears some redness and swelling accompanied by some pain and tenderness; the pain should not last over a day or two but some swelling may persist for a week or more. Under treatment there occurs a slowly progressive flattening of nodules and placques, together with disappearance of scales and crusts. Tiny ulcers may appear about the site of injection. Some erythema persists but the active lesions are gradually replaced by pale smooth scar tissue. There is always a tendency to relapse and the heal-

ing process may take months. The esters of hydnocarpus oil are absorbed very slowly and their effects on lupoid tissue continue for some time. The 15 cases summarized in this paper all attended a tuberculosis dispensary of the Lancashire County Council and their lesions had reached a more or less stationary stage, previous treatment having consisted chiefly of local and general artificial light and occasional "spiking" with acid nitrate of mercury. The duration of the hydnocarpate treatments has varied from six months to three years, some cases eventually receiving only monthly injections. Progress has certainly been more rapid than with artificial light alone but the two measures can well be combined. Of the 15 cases, 7 were classified as definitely quiescent, and 2 others quiescent except for a few nodules. Of the other 6, 3 were much improved and 3 only slightly so.—*Lupus Vulgaris: Treatment by Intradermal Injection of Hydnocarpates, J. E. Wallace, Brit. Med. Jour., June 5, 1937, 1151.*—(*A. P.*)

Boeck's Sarcoid.—Six clinically unrecognized cases of sarcoid are reported in this paper. In all but one of these death was due to some major disease, and the lesions of sarcoid were not recognized until histological sections were examined. In the one excepted, atypical tuberculosis was diagnosed both clinically and at the time of autopsy, but the case is now believed to have been one of fatal sarcoid. Boeck's sarcoid is believed by many to be closely related to tuberculosis although tubercle bacilli have been reported present only in early lesions. On the other hand the usual absence of tubercle bacilli and the clinical course of the disease, a benign affair of middle life, suggests some other aetiological agent. In the case believed to have died of sarcoid, a middle-aged Negress, there was impairment of the entire lung with diminished breath-sounds. The patient was markedly dyspnoeic with wheezing respiration. No cutaneous lesions were noted. On autopsy, the striking gross lesion consisted of numerous flat firm white nodules from 1 to 4 mm. in diameter scattered over the parietal pleura of the right lung posteriorly and the parietal pericardium. In the group as a whole the lesions were most common in the liver and spleen with the lungs second. In four of the cases the former organs were enlarged. Microscopically the lesions exhibited the usual structure of Boeck's sarcoid. Only a small amount of collagen was present in the case in which death was due to a sarcoid infection. In all the other cases, in which the lesions of sarcoid were incidental findings, a relatively large amount was present between the lesions and often within them. Most of the cells had disappeared, leaving only elliptic macrophages and the giant cells. Ziehl-Neelsen stains for tubercle bacilli were always negative. This series of cases is apparently the first in which lesions have been reported in the myocardium, endocardium, pancreas, testis and vertebral and femoral marrow. The following criteria are suggested for differentiating sarcoid from tuberculosis in sections: (*1*) Caseation should never be present and neutrophilic polymorphonuclear leucocytes should be absent. (*2*) The giant cells are different than those seen in tuberculosis. They show moderate variation in size, are usually much larger and contain many more nuclei (often as many as from 25 to 30) which are evenly distributed throughout the cell and are seldom arranged in the elliptical manner typical of tuberculous giant cells. (*3*) Lesions in the tissues other than the lungs do not contain carbon pigment. (*4*) In the liver the lesions are most numerous in the portal triads, with only a few in the midzones of the lobules. In miliary tuberculosis the reverse is true. (*5*) With silver impregnation, a delicate reticulum is always present in the lesion. In tuberculosis this is destroyed by the onset of caseation. (*6*) No evidence of tuberculosis is found anywhere in the body. In determining the activity of the infection the amount of collagen present seems to be a more accurate index than the presence of giant cells. A minimal amount would indicate activity whereas an increased amount indicates a healing reaction.—*Boeck's Sarcoid. Report of Six Cases in Which Autopsies Were Made, D. A. Nickerson, Arch. Path., July, 1937, xxiv, 19.*—(*J. S. W.*)

Tuberculosis of Mucous Membranes Treated with Carbon Dioxide Snow.—Twenty-one cases of tuberculosis of the mucous membrane of either mouth, tongue, nose, pharynx, larynx, or a combination of several of these regions were treated with applications of carbon dioxide snow mixed with acetone and the results were more favorable than those obtained from any other method of treatment employed in the past. Details of the preparations of the mixture and the method of application are given. On the average about four applications were necessary. Following each application there was a little swelling of the involved area and an occasional rise in temperature which subsided within 24 hours. Troublesome symptoms such as dysphagia and pain were often relieved after the first application. The scar tissue following the healing of the ulcerations was very fine and

delicate offering little interference with normal function.—*The Use of Carbon Dioxide Snow in Tuberculosis of Mucous Membranes of Mouth and Upper Respiratory Passages, A. P. Ilisch, Probl. Tuberk., no. 6, 1936, p. 858.*—(*W. A. Z.*)

Cadmium Treatment of Tuberculosis.—The case of pulmonary tuberculosis unsuitable for any form of collapse therapy, yet not responding to sanatorium treatment, always presents a problem. Among other substances the salts of heavy metals have attracted attention, especially gold. L. E. Walbrun, in an important research, found the only definitely inhibitory effects on experimental tuberculosis to be exerted by barium, aluminium, cerium, selenium, molybdenum, ruthenium, lanthium, and cadmium. This last is the most convenient to use. In 1927 N. Lund treated 38 patients with cadmium diuretin and claimed that 24 lost tubercle bacilli. Others have employed it in other combinations. Prodau did some experimental work on cats introducing cadmium salts by inhalation and ingestion. Toxic symptoms are increased respiration, salivation, anorexia, vomiting and depression. Absorption is slow. Excretion is through kidneys and intestinal tract. In small amounts pulmonary fibrosis was constant. Heaf, in preliminary experimental work on guinea pigs and rabbits, found cadmium sulphide nontoxic, painless; it stimulated fibrosis and inhibited tubercle formation. He used a one per cent solution in olive oil (sterile) for treatment of patients. This is kept in 50 cc. sterile rubber-capped vaccine bottles with a few glass beads to prevent clumping and is injected intragluteally in maximum doses of 3 cc. He treated 27 patients, with improvement in 21. Tubercle bacilli disappeared in 13 out of 25. Twenty gained considerable weight and 11 showed roentgenographic improvement, in 19 sputum diminished. Only 2 exhibited any untoward symptoms, although many of the cases were of an advanced and serious type. He regards the results as encouraging and warranting more extensive trial.—*The Treatment of Tuberculosis by Heavy Metals, Excluding Gold, but with Particular Reference to the Use of Cadmium, F. Heaf, Brit. Jour. Tuberc., April, 1937, xli, 66.*—(*A. P.*)

Reflex Therapy of Haemorrhages.—The author discusses the pathogenesis of pulmonary haemorrhages, and, after particularly stressing the neurovegetative factor underlying them, comes to the conclusion that in many cases the haemoptysis is the expression of vasomotor disturbances. He then analyzes the many forms of treatment proposed at various times. In his opinion, the good results obtained with some of them (application of ice, hot enemas, etc.) can be traced directly to a single mechanism of action, that is, a pulmonary vasoconstrictor reflex. He reports having been able to control haemorrhages, of some entity, due probably to diapedesis, simply by tickling with a feather the nasal mucosa of the patients at intervals of a few hours, for two or three days. He cites, in this respect, the fact that a bronchospasm can be produced through nasal stimulation.—*Riflessoterapia delle emottisi, M. Lucacer, Riforma med., no. 8, 1937.*—(*G. W. W.*)

Treatment of Syphilis in Tuberculous Patients.—Between February, 1930 and September, 1936, 69 patients (55 white and 14 colored) at the Wm. H. Maybury Sanatorium were given 2,776 treatments for syphilis. In 5 cases the syphilis was congenital and in 64 it was acquired. Three colored children with childhood-type tuberculosis improved satisfactorily and were discharged with their tuberculosis apparently arrested. Among the white patients, 7 were classified as minimal pulmonary tuberculosis, 24 moderately advanced, and 24 far advanced. Among the colored patients there were 6 moderately advanced and 5 far advanced. In the white group, after antisyphilitic treatment, 67.3 per cent showed improvement of their tuberculosis, 25.4 per cent were unchanged, and 7.3 per cent showed progressive disease. In the colored group the percentages were, respectively, 63.6, 27.3, and 9.1. In a comparable group of nonsyphilitic patients, progressive disease was found in 7.7 per cent of white patients and in 23.3 per cent of colored. Between January 1, 1932, and September 30, 1936, 70.5 per cent of 2,114 white patients, discharged from the Sanatorium, showed improvement of their tuberculosis. During the same period, 68.5 per cent of 127 colored patients discharged showed improvement. These figures compare favorably with those found in the group treated for syphilis. Among 22 patients whose blood Wassermann and Kahn reaction changed from positive to doubtful or negative, 17 showed improvement of their tuberculosis, 2 were unchanged, and 3 showed progressive disease. The progression in the three latter was not definitely related to the amount or kind of treatment since many other patients treated similarly showed improvement of their tuberculosis. In only 4 of the 69 cases was it at first suspected that the tuberculosis might have been made worse by antisyphilitic treatment, but 3 of these again

improved, 2 under continuation of treatments. No attempt was made to determine which drugs were more effective in treatment. It is desirable that the drugs used cause no serious local or general reaction. During the first two years treatment was given cautiously with half doses. During the next two years dosage was gradually increased. During the last two years the doses have been such as might be used for nontuberculous patients. During the past year treatment has been continuous, no rest periods being allowed. Present treatment consists of courses of Mapharsen 0.04 to 0.06 gm. per week for from 8 to 10 weeks, alternating with slightly overlapping courses of sodium bismuth thioglycollate 0.2 gm. twice a week for from 6 to 12 weeks. This series of cases shows that progressive tuberculosis is not more frequent in the treated tuberculous syphilitic patients than in similar groups of nonsyphilitic tuberculous patients; also, that treatment of syphilis lessens the frequency of progressive tuberculosis. From the results shown adequate treatment of syphilis in tuberculous patients is justified.—*Treatment of Syphilis in Tuberculous Patients: Preliminary Report, C. R. Smith, Amer. Jour. Syph., Gonor. & Ven. Dis., January, 1938, xxii, 72.*—(*L. F. B.*)

Artificial Pneumothorax.—Three hundred and one cases of pulmonary tuberculosis that were treated with pneumothorax for a period of from 4 months to 13 years and reexpanded, were studied roentgenographically. The period of observation after reexpansion extended from 2 months to 12 years. The material was divided into two groups. The first included all patients in whom pneumothorax was started within 6 months after the onset of the disease and all lesions were exudative with or without early cavitation. In the second group were included patients in whom pneumothorax was started from within 6 months to 2 years following the onset. The tuberculous process in this group was progressive and fibrocaseous. One hundred and forty-three cases of the 301 were eliminated because they showed massive adhesions which interfered with the closure of cavities. Of the remaining 158 that had effective pneumothorax, 72 belong to the first group and 86 to the second. The study was conducted on a serial roentgenographic basis. The author conlcudes that the reparative process in a collapsed lung is influenced by the type and age of the lesion at the time pneumothorax is begun, the length of time the lung is collapsed and the effectiveness of the collapse. In the material studied, early infiltrative, cavitary and noncavitary lesions remained arrested after having had effective pneumothorax for 4 years and longer. Fibrocaseous lesions remain arrested after 5 to 6 years of pneumothorax therapy. Relapse of cavities occurred in patients of this type of lesion in whom the pneumothorax was discontinued after 3 to 4 years of treatment. Relapses with cavity formation were frequently observed in cases that had effective pneumothorax but with the presence of adhesions. Adhesions therefore should be severed even when they do not interfere with the closure of cavities and the sputum is negative.—*Roentgenographic Observation of Reparative Processes in Pulmonary Tuberculosis under the Influence of Artificial Pneumothorax, H. F. Perschina, Probl. Tuberk., no. 1, 1936, p. 74.*—(*W. A. Z.*)

Pneumothorax Treatment.—Crocket makes a plea for a more widespread use of the treatment in early and acute pulmonary tuberculosis, in suitable ambulant cases, and for bilateral artificial pneumothorax. Collapse therapy originally won its spurs in the treatment of advanced cases of disease. Forlanini limited himself to advanced cases with bilateral lesions. Even the acute case was not considered bad enough to subject it to possible risks. But with modern improvements in technique the indications ought to be widened, as too few of the acute cases will improve sufficiently without it. Lawrason Brown long ago predicted its use in all early cases in the future and the early stage is certainly the time to obtain an ideal collapse. The bad results occur in the advanced toxic cases, although even there it may produce marvelous results. It is vexatious to encounter the not infrequent callousness of public health authorities, especially when the case of a young adult who cannot afford a private institution is notified as urgent, yet may not be visited for a week or more and then is perhaps left alone five or six weeks. Crocket cites the case of an Italian with largely unilateral disease who refused sanatorium care, went down hill and returned to Italy. Nearly a year after the diagnosis he went to a hospital near Naples to consult Castellani, was X-rayed and pneumothorax induced. After two months he came back to Scotland to resume work, was referred to Crocket and got fortnightly refills while building up a prosperous business. It is unfortunate that a stay in a sanatorium often handicaps a patient later. For nine years Crocket has carried out ambulatory pneumothorax on many patients with encouraging results and now, in the face of a new case provided the lesion is unilateral and the general condition not impaired, and the home conditions satisfactory,

he makes it a rule to advise domiciliary measures and pneumothorax. This is usually begun at home and carried on at the consulting rooms or dispensary after a few weeks. Such practice is quite common in other countries, especially America. X-ray control is possible by portable equipment when necessary. Introduction of this treatment into practice is credited to Parry Morgan of Cardiff, Wales (1912) and Ascoli of Palermo, who also emphasized the use of low pressures to cause simple lung relaxation. Where performed simultaneously the results have not been encouraging in most cases (usually not over 10 per cent) although a few American workers have reported successes in 50 per cent or more. Crocket, when he changed to using it in less toxic and advanced cases, found one-third definitely helped and rendered sputum negative, and one-third improved. About half were treated for a flare-up in the contralateral lung. Its indications may be summarized: (*1*) contralateral lesions occurring during unilateral collapse; (*2*) persistent haemoptysis failing to yield to unilateral pneumothorax; (*3*) acute bilateral bronchopneumonia, limited to the upper lobes; (*4*) bilateral cavitation, especially the moth-eaten type; (*5*) contralateral pleurisy; (*6*) mediastinal mobility interfering with unilateral collapse; (*7*) mesially located lesions; (*8*) pregnancy complicating bilateral tuberculosis. Chief contraindications are: (*1*) marked toxaemia or cachexia, especially with myocardial impairment; (*2*) marked dyspnoea with low vital capacity—under 1,500 cc.; (*3*) large fibrous cavities adherent to the chest-wall. Advanced disease itself is not a contraindication, nor even the presence of complications, other than intestinal and genitourinary disease. Advanced years, over 45, interfere with compensation. Usually the more affected lung is first treated and the second side not treated until the patient can go a week without refills on the other side. The aim is to have the pressure on the two sides nearly equal to avoid mediastinal swing. It is not a suitable procedure for ambulatory patients. Lung puncture risk is minimized by using a needle of not over 1.2 mm. external diameter. It is generally advisable to let up the less affected lung as soon as possible after a year of collapse, on the worse side it may be kept up indefinitely. Bilateral artificial pneumothorax is definitely beneficial in selected cases, offering relief to many and arrest to a few. While it may prove useful in advanced cases, it is particularly indicated with lesions limited to the upper or central zones. The end results depend on the general condition and proper selection, the technique and skill employed and the facilities for adjuvant measures—rest, gold therapy, thoracic surgery.—*Artificial Pneumothorax Treatment, with Special Reference to Bilateral Collapse, J. Crocket, Brit. Med. Jour., August 7, 1937, p. 261.*—(*A. P.*)

Pneumothorax Effusions.—Many observers in the past few years have called attention to the fact that the occurrence of a pleural effusion in the course of artificial pneumothorax is often soon followed by an increase of the pulmonary collapse and even by the disappearance of cavities which had previously resisted positive pressures. Several factors have been thought to be responsible for these beneficial changes, and they are critically analyzed. Neither the theory of direct compression of the fluid upon the lung, nor that of detention, according to which the fluid would serve to "float" the base of the lung and thus release the tension of the upper lobe, are satisfactory explanations in all instances, as the reported changes have been known to occur even when the amount of fluid was very small, and therefore could not act as a mechanical factor. It would be equally difficult to believe that the immunizing effect, produced by the effusion, is to be credited for the rapid disappearance of cavities. A very important rôle is probably played by the neurofunctional factor. After reviewing the recent studies of Viola, Luisada, and others, on the bronchopulmonary vegetative nerve system, the hypothesis is formulated that in such cases we are dealing with a vagotonia, which might prevent the lung from collapsing. The inflammatory process of the pleural effusion would modify and correct this condition. Two case histories are reported, in which the vagotonia was evidenced by the presence of severe asthmatic attacks, complicating the tuberculosis of the lung. In both cases the pneumothorax had long been unsatisfactory in spite of frequent and large refills of air, and in both cases the occurrence of a pleural effusion was rapidly followed by a more complete collapse, by marked improvement in the general condition, and at the same time by the disappearance of the asthmatic attacks. —*Rilievi clinici sulle modificazioni del tono polmonare nella pleurite parapneumotoracica e meccanismo dell'azione benefica di questa, M. Mazzetti, Riv. pat. e clin. d. tuberc., August, 1937, Fasc. VIII, 583.*—(*G. W. W.*)

Haemorrhage in Pneumothorax.—Spontaneous intrapleural haemorrhage is a rare complication of artificial pneumothorax. When it occurs it is due to rupture of the lung or of adhesions carrying rather large blood vessels. The treatment of this com-

plication must be decided by the exigencies of the individual case. Aspiration of the fluid should be done if the patient is dyspnoeic but interference should be minimal because of the danger of pyogenic infection. Three cases from Sea View Hospital are reported and the literature has been rather thoroughly reviewed.—*Massive Intrapleural Haemorrhage as a Complication of Artificial Pneumothorax, A. Hurst & H. H. Epstein, Quart. Bull. Sea View Hosp., January, 1937, ii, 155.*—(*A. A. E.*)

Artificial Pneumothorax in Children.—Eighty-two children with pulmonary tuberculosis were treated with artificial pneumothorax. The age distribution was: six months and younger 10, six to twelve months 17, twelve to eighteen months 18, eighteen months to two years 5, two to four years 13, four to thirteen years 19. Thus 63 children of the 82 that received pneumothorax were not over four years of age. The indications for pneumothorax in children are infiltrative lesions that show cavitation or tendency to cavity formation, pneumonic lesions without cavitation that show no tendency to retrogression. Effective pneumothorax resulted in a comparatively small number of children and is explained by the fact that the infiltration usually involves the pleural surfaces early and obliterative pleuritis is the result. A complete collapse was obtained in 22 cases, a partial collapse resulted in 29, a pocketed collapse that was soon discontinued appeared in 14, the pleural space was found to be obliterated in 9. Eight children were given bilateral pneumothorax. The pneumothorax was maintained an average of four months in those children in whom the collapse was effective with a maximum of eleven months. In the older children the treatment was continued up to three years and longer. The most common complication was subcutaneous emphysema, of which there were 38 cases; it is largely due to the likely lack of coöperation. The complication is not serious and did not interfere with further treatment. Twelve cases developed pleural effusion, ten were minimal and disappeared; of the two large effusions one became an empyema. Summary of the results in 63 cases in whom the treatment was completed showed that the treatment was of no benefit in 25 children who had multiple cavitation with dissemination; of 27 children that had unilateral cavernous disease without dissemination, 10 got well, 3 improved, 14 became worse; of 11 children that had infiltration without cavitation and negative sputum, 3 became well, 4 improved, 4 became worse. The author concludes that pneumothorax should not be given to children with far advanced bilateral tuberculosis. Pneumothorax in children is not dangerous and can be given when indicated without general anaesthesia. Great care should be exercised in giving pneumothorax to children that show tumorous enlargement of the tracheobronchial lymph nodes.—*Artificial Pneumothorax in Young Children with Pulmonary Tuberculosis, S. I. Voltchok, Probl. Tuberk., no. 6, 1937, 47.*—(*W. A. Z.*)

Insatiable Pneumothorax.—Although the occurrence of the so called insatiable pneumothorax is a rather frequent and disappointing complication, its pathogenesis and mechanism of action, and, consequently, its treatment, are still a matter of speculation. Burnand, who first described it, thought it was due to a very active gas absorption by the pleural surface which had preserved a normal capillary vascularization. This theory, however, has been variously disputed, and the intrapleural injections of gomenol, suggested for the purpose of irritating the pleura and thus impairing its capacity to absorb, have not been followed by uniform results. Some time ago, Lucacer advanced the hypothesis that the insatiable pneumothorax could be related to disturbances of the pulmonary vegetative nerve system, and more particularly to vagotonia, which, by producing bronchial obstruction, and at the same time alveolar dilatation, would not only prevent the pulmonary collapse, but also facilitate the absorption, under pressure, of the air from the pleural cavity. On this assumption, he obtained good results in several cases of resistant pneumothorax by treating the patients with daily injections of small doses of bellafolin. Entirely accepting Lucacer's theory, the author has considered the feasibility of alcoholization of the vagus in order to interrupt temporarily its action upon the lung. He feels that the operation, which for anatomical reasons can only be practiced on the right side, is simple and presents few dangers. The technique consists in exposing the nerve in the supraclavicular region and in injecting it with alcohol immediately below the branching off of the inferior laryngeal nerve. In two such operations he obtained good results which persisted three years after the operation.—*Sulla possibile cura chirurgica del pneumothorace insaziabile, G. Pieri, Policlin., March, 1937, x, 457.*—(*G. W. W.*)

Induced Pleural Exudates in Pneumothorax.—Bilateral pneumothorax becomes much safer and more effective if we fix the sound areas to the chest-wall so that only diseased parts are collapsed. By suitable adjustment of intrapleural pressure, we can bring the healthy lobe into contact with the

chest-wall while the diseased lobe remains contracted. At this stage an artificial pleural effusion can be produced which, during reabsorption and organization, obliterates the spaces between the pleural surfaces in contact. Then by the usual refills with an end pressure about zero, we can keep a complete but selective collapse of the diseased lobe. A 50 per cent glucose solution is injected into the pleural cavity, the initial dose usually being 50 cc. but occasionally up to 150 cc. There is but slight and transient discomfort. After the injection enough air is withdrawn to bring visceral and parietal pleura over the lower lobe into contact. The hypertonic glucose causes bursting and desquamation of the endothelial cells and serous exudation from denuded surfaces. There is always some elevation of temperature, the highest observed being 103°F., usually dropping to normal in three or four days, at most in a couple of weeks. Purulent exudates or parenchymal disseminations were never observed. A combination of pneumothorax on one side with contralateral phrenic paralysis rarely yields favorable results, as respiration is usually affected, but if done, lobe fixation should precede the diaphragmatic paralysis of the other side. Apicolysis and contralateral pneumothorax form a better combination, but because of the problems of the presence of a foreign body and danger of perforation, apicolysis is not to be commonly resorted to. If done, fixation of the lower lobe on the pneumothorax side is advised. Lobe pneumothorax and thoracoplasty are a potentially dangerous combination but less so with lobe fixation. The method is, of course, not suitable for ambulant cases. Case reports and roentgenographic reproductions accompany this paper. —*The Therapeutic Possibilities of Artificial Pleural Effusions, G. Maurer, Brit. Jour. Tuberc., April, 1937, xxxi, 58.*—(*A. P.*)

Air Embolism and Spontaneous Pneumothorax in Artificial Pneumothorax. —Brandes, in 1912, accidentally demonstrated the mechanism of air embolism while trying to outline an empyema cavity by injecting bismuth. The rubber catheter had injured and opened some very small pulmonary veins, through which the bismuth entered and travelled to the cerebral cortex. The patient exhibited spasm and ocular deviation. Symptoms commonly observed in this connection have been pupillary dilatation or failure to react, ocular deviation, dizziness, blindness, headaches and paresthesias; also tonic and clonic convulsions, unconsciousness, vomiting and, if recovery occurred, transient paralysis or aphasia. Irregular respiration and abnormal heart action have also been reported. Laurenti has described three types of reaction accompanying puncture of the pleura—syncopal, convulsive, and hemiplegic, together with modifications of autonomic or sympathetic nervous origin. He attributes many of the transitory disturbances to cerebral ischaemia from vasospasm. Brauer's view, stated in 1913, that all serious accidents are due to air embolism, has gained favor. Although Cordier believed he induced pleural shock by chemical irritation, Croizier, repeating his experiments, only induced convulsions, crises and death when he injected the irritant into lung tissue. In fact, when one mechanically irritates the normal pleura, there is no constant specific effect on the central nervous system, only protective movements or homolateral clonic contractions resulting from stimulation of the parietal pleura, while extensive fibrosis may block the stimuli. On the other hand, in empyema cavity walls, blood vessels are suspended between fibrous strands and, as Schlaepfer has shown, when injured their walls cannot contract, air may enter from the needle or empyema cavity and likewise may enter the vessels in diseased lung areas. Wever has described the retinal changes following experimental injection of air into the carotid artery and similar observations have been made in humans following accidents. The intravenous pressure is normally low and the suction power in man may amount to −7 to −8 cm. of water. Following accident, in some cases albumin and casts occur in the urine, probably due to temporary renal blockage or thrombi. The time of occurrence of symptoms is important. Most cases have shown definite evidence of adhesion of the lung to the chest-wall. The incidence of air embolism is variously reported. The condition appears to be attended with a considerable mortality, 30 to 50 per cent. The treatment is absolute rest with the head low. Prophylaxis involves careful observation of the manometer and avoidance of tearing of adhesions. Myers, Levine, and Leggett record 6 cases among 150 patients, 4 fairly severe but only one fatal. No case has occurred since 1929. *Spontaneous pneumothorax* occurs in from 2 to 14 per cent of cases of artificial pneumothorax, the Matsons reporting 3.3 per cent and Dumarest and Brette 4 per cent. This is usually due to direct lung injury or to burrowing through the visceral pleura. It may be open, valvular, or closed, the latter having the best prognosis. Bard believes it a frequent cause of pleural exudate, as does Lux. Acute perforations are especially common in bilateral therapeutic pneumothorax. The symptoms vary and definite diagnosis is made by the manometer. The

chief complications are exudate, persistent bronchial fistula and aggravation of the disease. The mortality is from 25 per cent upward. Treatment is principally symptomatic with reduction of intrapleural pressure wherever indicated and aspiration of empyema when it occurs, or radical surgery. With permanent bronchial fistula thoracoplasty offers the only hope of recovery. Oleothorax may be of some value in small fistulas or to combat empyema. Prevention again involves avoidance of trauma and tearing of adhesions and earlier induction of pneumothorax.—*Air Embolism and Spontaneous Pneumothorax Complicating Artificial Pneumothorax, J. A. Myers, I. Levine & E. A. Leggett, Brit. Jour. Tuberc., April, 1937, xxxi, 76.*—(*A. P.*)

Sputum Conversion during Pneumothorax.—Pneumothorax treatment was used in 504 cases at Sea View Hospital during 1934. These patients fell into three categories: (*1*) 95 (18.9 per cent) in whom no adequate pleural space could be obtained; (*2*) 195 (38.6 per cent) with free pleural space who were treated at regular intervals but whose sputum remained positive; (*3*) 214 (42.5 per cent) whose sputum became negative for acid-fast bacilli during the administration of pneumothorax and remained so for six months as shown by smears, concentrations and examinations of the gastric contents. Further analysis showed that sex and the side of affection had no bearing upon the effectivity of pneumothorax; but the duration of illness and the age of the patient were of decided importance. It was found that pneumothorax was more effective in patients with disease of less than one year duration than in those who had been ill for longer than that period. It was also more effective in younger individuals. Conversion to negative sputum was most frequent in the first three months of treatment. It was found that positive intrapleural pressures were unnecessary in the first three months of treatment but that after this period it may be necessary to induce higher pressures in order to render the sputum negative.—*Rates and Ratios in Conversion of Sputum during Pneumothorax Treatment, R. A. Bendove, B. Miller & H. Alexander, Quart. Bull. Sea View Hosp., January, 1937, ii, 137.*—(*A. A. E.*)

Results of Artificial Pneumothorax.—About the beginning of 1933 the Joint Tuberculosis Council set up a committee, headed by R. R. Trail, to pursue this investigation. It decided to use, as far as possible, methods similar to those of Bardswell and Thompson at Midhurst published in 1919. To this end it addressed an enquiry to some 200 institutions, of which 42 collaborated, the necessary particulars being supplied on schedules. The greatest difficulty was found in selecting some comparable control group to serve as a standard of comparison. For this purpose, were finally selected the patients of the King Edward VII Sanatorium, Midhurst, Surrey, who had at some time shown a positive sputum and were discharged on and after July 1, 1911. It was considered desirable to exclude, as far as possible, the experience of remote years during which tuberculosis mortality was notably higher. These "Midhurst controls" were analyzed only according to group on admission (see classification of pneumothorax cases) and sex. The pneumothorax cases were classified according to year of induction, or attempted induction or admission, and divided into 3 groups, as follows: (*1*) cases of unilateral disease without cavitation; (*2*) cases with cavitation limited to one lung and contralateral lesions limited to one-third of lung; (*3*) all other cases, including serious complications. For comparison, the cases were classified as described above and the number of survivors at the close of the observations given separately with added information as to presence or absence of bacillary sputum and the proportion these survivors represented of the total number of inductions attempted or, in the case of Midhurst, of admission. Tables are included showing the numbers "exposed to risk" each year, the deaths according to time interval since induction, attempt or admission, and the ordinarily expected mortality according to English Life Tables No. 9, based on the population in England and Wales for June, 1921 and mortality from all causes in the three years 1920–1922, with due regard to age and sex. Attempts to obtain the total number of survivors for various time intervals elapsed since first observation proved impracticable. Also, it is observed that any conclusions based on cases where ancillary methods were used must be viewed with reservations as to how much they contributed to the end results. A comparatively insignificant proportion of cases was untraced, about 1.5 per cent of both successes and failures. Great subdivision of groups was not attempted. I. *Comparison of "Controls," Successful Pneumothorax and Pneumothorax Failures:* For individual year periods the figures were too few to be significant. For the entire period up to 1929, among the "control" men, 30.3 per cent of group I were dead of tuberculosis, 52.9 per cent of group II and 72.1 per cent of group III. Among the "control" women, 24.7 per cent of group I, 51.2 per cent of group II and 71.9 per cent of group III. For the

successful pneumothorax group where ancillary methods were not used, by the end of 1932, among the men of group I, 21.8 per cent were dead of tuberculosis, 29.3 per cent of group II, and 50.2 per cent of group III; among the women, 20.3 per cent of group I, 32.7 per cent of group II and 56 per cent of group III. For the successful pneumothorax group where ancillary methods were used, of the men in group I 15 per cent were dead of tuberculosis, in group II 11.2 per cent, in group III 29.1 per cent; of the women in group I 6.6 per cent, group II 11.5 per cent, group III 26.3 per cent. For the pneumothorax failures where ancillary methods were not used, at the end of 1932, there were dead of tuberculosis among the men of group I 36 per cent, group II 54.6 per cent and group III 75.4 per cent. For women the proportions dead were: of group I 44 per cent, group II 52.6 per cent, group III 81.3 per cent. For the group of pneumothorax failures where ancillary methods were used, the proportion dead of tuberculosis among the men was: of group I 4 per cent, group II 19.1 per cent, and of group III 28.9 per cent. Among the women, of group I 0.0 per cent, group II 22.3 per cent, and of group III 41.2 per cent. The total number of the successful pneumothorax group was 3,021, of whom slightly less than one-third (978) had ancillary methods used, these being fewest in group I. The total number of the pneumothorax failure group was 1,229, of whom slightly more than one-third (484) had ancillary methods used, also being fewest in group I. The total number of the Midhurst "controls" was 2,750, of whom about two-thirds were men (1,754). Of this group the total mortality from tuberculosis (up to 1929) was 58 per cent. II. *Comparison of Mortality Rates in "Controls" and Pneumothorax Groups with Expected Mortality Rates for General Population:* Here the years of "exposure to risk" from 0 to 17 inclusive are shown with the actual deaths (fatalities) per each year and both the ratio of actual to expected deaths and the crude mortality rates were calculated for each group. Among the Midhurst "controls" the ratio of actual to expected deaths was: among the men of group I 6.2, group II 11.3 and group III 21.3. Among women of group I, it was 6.6, group II 14.8 and group III 31.5. In the group of successful pneumothorax without ancillary methods, the ratios for men were: for group I 13.6, group II 19.3 and group III 40.6, and for women of group I 20.6, group II 34.3 and group III 73.1. In the group of successful pneumothorax with ancillary methods, the ratios for men were: group I 13.0, group II 10.5 and group III 21.4; and for women of group I 5.7, group II 13.4 and group III 39.6. For the group of pneumothorax failures without ancillary methods, the ratios for men were: group I 33.3, group II 41.3 and group III 74.6; and for women of group I 64.1, group II 56.2 and group III 14.8. For the group of pneumothorax failures with ancillary methods the ratios for men were: group I 5.6, group II 20.0 and group III 63.1; and for women of group I 0.0, group II 26.9 and group III 54.7. *Comment on Results of Study:* It would probably be wrong to conclude that, contrary to general opinion, pneumothorax treatment has not the value ascribed, even though it is only in successful cases where ancillary methods were used that the results are demonstrably superior to those in the Midhurst "controls." Probable sources of error are: (*1*) better economic and general position of Midhurst "controls," (*2*) too advanced disease and correspondingly poor prognosis in many of the pneumothorax groups, (*3*) too recent date of many of the pneumothorax inductions or attempts. The first two factors weigh against the pneumothorax groups, the last in their favor. Also, a certain number of the "pneumothorax failures" must be considered unfavorable economic and psychological risks. The "will to recover" must always be considered as a factor. It is admitted that the results of the entire study are inconclusive. It is felt that there are unperceived inconsistencies of classification. It is held that "controls" should be more strictly comparable apart from the pneumothorax factor (but how to achieve this is not suggested).—*Report on a Statistical Investigation of the Results of the Treatment of Pulmonary Tuberculosis by Artificial Pneumothorax, W. Brand, P. W. Edwards, C. O. Hawthorne, G. Jessel, S. V. Pearson, D. A. Powell, D. P. Sutherland, J. Watt, R. R. Trail & G. D. Stockman, Report to Joint Tuberculosis Council, Tubercle, Supplement, February, 1937.*—(*A. P.*)

Diffusion Pneumothorax.—Some time ago Parodi described a new phenomenon observed by him in a number of pneumothorax cases, which he called "pneumotorace terapeutico-perpetuo da diffusione." If, he reported, before the refill of a normal pneumothorax, all the gas is aspirated from the pleural cavity, and then, immediately after, new air is injected, the volume of air necessary, not only to raise the intrapleural pressure back to the level it had prior to the experiment, but even to a positive level, will be smaller than the volume of air just aspirated. He found that the pressure thus obtained remains constant for several days, and that the pulmonary collapse is often greater than before. Parodi could not fully

explain the mechanism of action of this phenomenon. He suggested that perhaps the aspiration of all the air from the pleural cavity produced in it a sudden depression, thus causing diffusion of the alveolar air from the alveoli into the pleural cavity, such air adding itself to the amount injected immediately after. Furthermore, the pressure exerted upon the lung by the pneumothorax usually stimulates a reflex bronchospasm, with consequent increase of the intraälveolar pressure. With the new technique, the bronchospasm would still be produced, but the alveolar tension, due to the diffusion of the air, would be lessened, and this might account for the better collapse obtained. In 30 experiments, the authors have verified the fact that the phenomenon, as described by Parodi, is constant and harmless. They found, however, that it will not occur if the refill is made either with pure nitrogen or with the same air which has been aspirated (containing 88 per cent nitrogen). From this they infer that the difference in the composition of the gas used is perhaps the underlying factor in the genesis of the phenomenon, and that the bronchospasm is its determining cause. The atmospheric air, they say, stimulates the bronchospasm, with resultant increase of the intraälveolar and intrapleural pressures, while, on the other hand, if nitrogen is injected, the bronchospasm is produced in a lesser degree or not at all. In this respect they mention the well known spasmolytic action of the nitrogen which has long been utilized in the treatment of asthma. This seems to be corroborated also by the fact that the phenomenon is again absent, if, before the experiment, a small dose of bellafolin is administered to the patient. They feel that if their assumption is true, practical applications could again be found for the use of pure nitrogen in pneumothorax treatment, especially in cases of "insatiable pneumothorax."—*Sul pneumotorace terapeutico-perpetuo da diffusione di Felice Parodi, M. Lucacer & F. Bruno, Riv. pat. e clin. d. tuberc., April, 1937, Anno XI, Fasc. IV, 275.*—(*G. W. W.*)

Artificial Pneumothorax.—One hundred and nineteen patients with unilateral disease, treated by ambulatory pneumothorax are compared with 120 similar cases treated by artificial pneumothorax and strict bed-rest for periods exceeding 3 months. In the former group there were 42 minimal cases, 54 moderately advanced and 23 far advanced and in the latter there were 16 minimal, 70 moderately advanced, and 34 far advanced cases. Age ranged from 10 to 69 years with the greater number between 20 and 24 years. There was no significant difference in development of complications among the minimal and moderately advanced groups. In the far advanced ambulatory group 5.5 per cent more developed empyema, but this difference is equalized if the patients who refused bed-rest, and in whom pneumothorax was instituted as a compromise measure, are excluded. Fewer minimal and moderately advanced, treated on the ambulatory basis, later stopped work than those in the group treated with long periods of bed-rest. Among the far advanced group more patients treated by the ambulatory method later stopped work because of the number of compromise cases. Deaths were fewer in the ambulatory group although the other group has been followed for a longer time. The chief reason for discontinuing pneumothorax was the development of obliterative adhesions. Included in the two groups are 60 patients who had bilateral disease when pneumothorax was instituted or who later developed significant lesions in the contralateral lung. In a second group of 35 patients treated by pneumothorax and who were never ambulatory, 2 were minimal, 10 moderately advanced and 23 far advanced. Of this group 21 are now dead, 2 are ambulatory, 2 working full time, and the remainder still hospitalized. A third group consists of 100 cases of transient cases or those started for other physicians. In a fourth group of 92 cases pneumothorax was recommended but no free space was found. Of this group 30 are dead, 53 are working or have good working capacity and 8 are untraced. The three essentials in the treatment of pulmonary tuberculosis are checking the spread of disease, conversion of positive to negative sputum, and restoration of the patient's working capacity. Bed-rest permits progression in too many cases to justify its exclusive use and all patients with unilateral disease should have pneumothorax attempted provided it is not contraindicated. If pneumothorax is not efficient after adequate trial it should be discontinued and surgery advised. Patients under pneumothorax treatment should be protected against exposure to other patients with positive sputum. In most minimal unilateral cases, many moderately advanced ones, and some far advanced, pneumothorax may be safely undertaken on the ambulatory basis and since there is a significant monetary saving to the patient and community this form of treatment should be extended in properly selected cases.—*Artificial Pneumothorax: With Particular Reference to the Ambulatory Patient, J. A. Meyers, Jour. Thoracic Surg., June, 1937, vi, 513.*—(*L. F. B.*)

Intrapleural Pneumonolysis.—The surgical division of pleural adhesions is not an end in itself but only a means of producing a satisfactory pneumothorax. If a partial pneumothorax seems unlikely to be successful pherenic paralysis should be used in preference to intrapleural pneumonolysis if the cavity is suitable for that operation. Pneumonolysis is preferred when an adhesion, suitable for division, overlies a soft, progressing lesion, especially if the lesion contains a superficial cavity, when an adhesion exerts a horizontal pull, and when active lesions in the contralateral lung require phrenic paralysis. Between 1927 and 1934, 111 patients were operated upon by the closed method and 29 by the open method. During a 5 year period these operations were used in only 14.8 per cent of 627 cases. Among the 111 cases adhesions were completely divided in 37.0 per cent, incompletely divided in 41.4 per cent and in 21.6 per cent the adhesions were found to be unsuitable for division. In 58.5 per cent, of 58 patients whose lesion was brought under control, results were excellent, good in 27.5 per cent, moderately good in 10.4 per cent, questionable in 1.8 per cent and worse in 1.8 per cent. In the remaining cases where the lesion was not controlled following pneumonolysis the percentages respectively were, 0.0, 0.0, 3.8, 28.3, 7.5, and were unsatisfactory in 60.4. Cavities closed in 51.1 per cent of 92 patients with cavities. There were no operative complications and few postoperative complications of importance. Ninety-five of the 111 cases had lesions in the contralateral lung, 35 apparently active and 31 of these having cavity formation. Of the 111 cases, 20.7 per cent are arrested or apparently so, 14.4 quiescent, 42.3 improved, 10.0 unimproved or worse, and 12.6 dead. Mortality directly or indirectly due to operation was 1.8 per cent. Open pleural pneumonolysis was done on 29 cases, in 21 of which the closed method had shown the important adhesions too short or complex to justify an attempt to cut them. Bleeding from the cut surface occurred 4 times, there were 11 transient pleural effusions, 6 persistent effusions 3 of which developed into pure tuberculous empyema, 4 cases of partial loss of the pneumothorax from adhesive pleuritis and 2 cases of severe dyspnoea. In the group of 29 cases, adhesions were completely divided in 65.5 per cent and incompletely divided in 34.5 per cent. Cavities were closed in 55.2 per cent. In this group, 20.7 per cent are considered arrested or apparently so, 3.4 per cent quiescent, 55.1 per cent improved, 10.4 per cent unimproved or worse, and 10.4 dead. Mortality due directly or indirectly to operation was 6.9 per cent. Closed pneumonolysis is a valuable operation in selected cases that are unsuitable for treatment by phrenic paralysis and in certain well selected cases is preferable to thoracoplasty. We believe open intrapleural pneumonolysis should be reserved for those patients in whom phrenic paralysis, if indicated, and closed pneumonolysis have been tried and in whom thoracoplasty is contraindicated, and to whom the operation offers the only chance of recovery.—*Closed and Open Intrapleural Pneumonolysis Results in 111 and 29 Cases, Respectively, R. S. Anderson & J. Alexander, Jour. Thoracic Surg., June, 1937, vi, 502.*—(*L. F. B.*)

Pneumonolysis.—This is a continuation of a previous report and concerns 100 operations performed on 68 patients between 1934 and 1936, their ages ranging between 16 and 49. The character of adhesions severed varied from simple bands to complicated systems of adhesions, sometimes more than four inches wide and two or more inches thick. The bands were single in 16 instances and more than six in 15. The diathermy and electrocautery were combined in 96 instances, the electrocautery being used alone in 4. Complete lung collapse was obtained in 31 of the 68 individuals and greatly improved collapse in 30, while in only 4 were the results considered unsatisfactory. Pleural effusions, immediately following operation, were recorded in only 12 cases, and in 8 were slight, just covering the diaphragm; later effusions, that is, occurring some weeks after operation, were recorded in 30 cases, and in 12 were slight. Temperature reaction was absent in 61 operations, evanescent in 31 and lasted over six days in only 3. Tuberculous empyema occurred in a single case four months after operation. Surgical emphysema occurred in 35 instances, being recorded as slight in 27. There were recorded in good health and sputum-negative 46 (67.7 per cent), in fair health 11, dead 1, with 10 others either very ill or showing relapse or extension of disease.—*Internal Pneumolysis, Result of 210 Consecutive Operations, Second Series, F. G. Chandler, Tubercle, May, 1937, xviii, 348.*—(*A. P.*)

Perforation and Haemorrhage in Cauterization of Pulmonary Adhesions.—Distinction is made between operative perforation which takes place immediately after operation and may occur in normal lung tissue, and secondary and late perforation. Secondary perforation occurs within a month following cauterization; it results from necrosis of the cauterized area, or one closely adjacent, with the rupture of tuberculous tissue, frequently of the wall of a cavity,

with contamination of the pleural space and the establishment of a tuberculous empyema with or without an added secondary infection. Late perforation occurs one or several months after cauterization and is said to result from an anaemic necrosis consequent upon the division of an adhesion enclosing a vessel which is nutrient to a portion of the visceral pleura. Small perforations are often intermittent, the aperture becoming closed by a fibrinous plug. Large perforations inevitably result in a serious empyema and usually a complicating secondary infection, unless the bronchus draining the cavity ruptured is plugged. It is essential to remember that the lung tissue is often drawn out and extends far into the adhesion. Transillumination may detect such a pulmonary extension into an adhesion. There must be a distance of at least 5 mm. between the site of cauterization and the surface of the visceral pleura. To prevent the sloughing of the lung parenchyma cauterization should be performed as close to the chest-wall as possible. With small temporary perforations deflation and morphine will overcome the hazard. With large perforations and empyema death is often the issue. Drainage by suction is the only remedy. Thoracoplasty should be performed as soon as the patient can bear the surgical procedures.—*Perforation of the Lung and Hemorrhage as Complications in Cauterization of Adhesions, illustrated with case histories, S. Cold, Acta tuberc. Scandinav., 1937, xi, Fasc. 3–4, 284.*—(*M. B. L.*)

One Hundred Pneumonolyses.—This series follows a previous consecutive series by the same author published in October, 1935. These operations were performed during 1934 to 1936 on 68 tuberculous patients, who were unselected, several having bilateral disease and some a bilateral pneumothorax. Chandler abandoned the use of the cutting current after his fiftieth operation of the first series, but he almost always used the coagulating diathermy current for coagulation before burning, except in obviously avascular adhesions. He regards the diathermy coagulating current as a safeguard and as essential for enucleation, which, however, he practises rarely. The mechanical result was complete collapse in 31 cases, greatly improved in 30, and unsatisfactory in only 4. Pleural effusions were not common and were seldom more than slight, that is, those occurring directly postoperatively. Later on they were somewhat more common. Surgical emphysema occurred 35 times, but in 27 it was only slight. Febrile reaction was usually absent and hardly ever more than evanescent. There was one case of tuberculous empyema developing four months after operation.—*Internal Pneumonolysis: A Further One Hundred Consecutive Operations, F. G. Chandler, Lancet, January 9, 1937, ccxxxii, 83.*—(*A. P.*)

Pneumonolysis in Pneumothorax.—Analysis of 168 cases of artificial pneumothorax that were observed for a period of one to ten years after reëxpansion is presented. All patients had an effective collapse, the sputum became negative for tubercle bacilli and they were free of all symptoms of disease. Fifty of this group had a complete collapse and the compressed lung was either free of adhesions or the adhesions were severed. Only two patients in this group reactivated and 48 are well and working. Fifty-eight patients had few adhesions and the collapse was effective without pneumonolysis; of these, thirty reactivated and twenty-eight are well and working. Thirty patients had many adhesions and though the collapse was effective, only nine patients had a lasting good result. Twenty-six patients had an effective collapse but massive adhesions were present and only in four was a lasting good result obtained. The author concludes that intrapleural pneumonolysis should be done in all cases of artificial pneumothorax when adhesions are present and surgical intervention is possible. Adhesions should be severed regardless of whether the collapse is effective or not. The operation offers little risk when the cases are properly selected and the proper technique is used.—*Should Adhesions be Cauterized in the Presence of Pneumothorax Resulting in Non-bacillary Sputum and Disappearance of Toxic Symptoms?, L. Kogan, Probl. Tuberk., no. 2, 1937, 67.*—(*W. A. Z.*)

Pneumonolysis.—Attempts at "pushing" a pneumothorax in the presence of adhesions situated opposite to the tuberculous lesions at which therapy is directed is frequently futile and often dangerous. The adhesions may be torn causing sufficient irritation of the pleura to precipitate a pleurisy, thus prejudicing the patient's future. Adhesions under tension transmit to the lung the respiratory movements of the thoracic cage, and the smaller the diameter of the adhesion the more trauma is incurred by the immediately adjacent portions of the lung. Because roentgenograms are not entirely reliable a lung which will not collapse readily must be suspected of having adhesions. Should this be the case any effort to push the pneumothorax will only aggravate the situation. If the adhesions are not seen and sectioned one may still get a satisfactory result in certain instances by per-

mitting the lung to reëxpand somewhat. This procedure is most likely to be successful if the adhesion is a long one and sufficiently loose not to transmit the movements of the chest-wall to the tuberculous lesions. The question then arises whether with pneumothorax in the presence of an adhesion one can ever be certain that an apparently well cicatrized lesion really is so. Scorpati has reported several instances where presumably well healed lesions situated near adhesions were found to be caseous. He has therefore raised the question whether with present diagnostic methods we can ever know that an adhesion is not exerting traction on the lung. The same author has instanced a case in which a cavity situated deep in the centre of the left upper lobe of the lung was directly influenced by an apical adhesion. The present authors cite from their own experience three illustrative cases. The first is that of a young man with bilateral pulmonary tuberculosis with a cavity on the left. The patient's sputum contained tubercle bacilli. He was afebrile. Pneumothorax was instituted on the left side eight months after the clinical onset of the disease. The sputum diminished rapidly in quantity, and at the end of three months there were no longer any tubercle bacilli in it. The roentgenographic appearance of the chest was such as to indicate a selective collapse had there not been present exactly opposite the principal lesion a long adhesion. The clinical appearance of the patient was so excellent that the pneumothorax was maintained for three years. After another seven months' observation he was pronounced cured, and was advised to increase his activity gradually. Several months later he returned to work, and continued in good health for a year and a half. There was then a return of symptoms with a productive cough, fever, haemoptysis. A new cavity had appeared exactly in the location where three and a half years previously there had been seen a sharply outlined irregular oval density. It seems unreasonable to suppose that this lesion would not have completely cicatrized during three years pneumothorax therapy had it not been for the adverse affect of the adhesion which was situated directly above it. The second case is that of a patient with a cavity in the left lung just below the level of the clavicle. The sputum contained tubercle bacilli. After two months of pneumothorax the cavity had collapsed, but the sputum remained positive. It was therefore decided in spite of adhesions to "push" the pneumothorax. Pressures varying from minus one to plus sixteen were obtained and the sputum became negative. The heart and mediastinum were shifted to the right, but the collapse achieved was practically total. Every attempt to reduce the intrathoracic pressure was followed by a reappearance of bacilli in the sputum, and after sixteen months pleuroscopy was resorted to and many adhesions severed. Pneumothorax was then reëstablished, but by this time the pleura at the base of the lung had become thickened and the collapse was therefore not as satisfactory as it should have been. The third case was much like the preceding. There was a cavity in the right upper lobe just below the clavicle. There were many apical adhesions. Because of these very little collapse could be accomplished by pneumothorax. After repeated instillations of small quantities of air over a period of several weeks sufficient space became available for the use of the pleuroscope. After section of the adhesions a very successful selective collapse was accomplished.—*Considérations sur la section d'adhérences, B. Michetti, Arch. méd. chir. de l'app. resp., 1937, xii, 145.*—(*C. L. D.*)

Technique of Thoracoplasty.—No operative technique can be considered satisfactory unless the results are successful in the large majority of cases. Although thoracoplasty has been in use much longer than lobectomy, for example, this claim cannot justifiably be made and the absence of consistent success has resulted in many and frequent variations in technique, one of the latest of which has been freeing the lung apex, as suggested by Semb. Early in 1935 it became apparent to Davies that his results in the few years previous were inferior to those in the early period 1912 to 1915 and also the period 1922 to 1930. During these years he used first the Wilms operation and later the one-stage ten-rib Sauerbruch paravertebral thoracoplasty. The type of case was usually more productive in character although there had been a long period of failure to respond to sanatorium treatment. The technique used was evidently suitable for that type of case. But with the more extended use of thoracoplasty, especially to collapse large cavities, the original Sauerbruch technique was less efficient and more complete collapse was attempted by increasing the extent of the rib resection. The operation being more severe necessitated two or three stages and, paradoxically, the collapse was often less satisfactory than with the original shorter rib resections. In certain American clinics this involved removal in a series of stages of whole ribs and even transverse processes. Davies has never been convinced that the results justified this drastic decostalization. In the original Sauerbruch operation the essential feature

was the bucket handle rotation of the remaining parts of the ribs, accompanied by torsion of the costal cartilages. The greater the length of rib left the greater the potential leverage. Beginning June, 1935, Davies attempted to find the maximum amount of rib resection necessary to retain efficient leverage on the costal cartilage yet to allow the cut rib ends the fullest space for approximation and this appears to be 10 to 12 cm. The tendency of cavities to become displaced into the sulcus between transverse processes and mediastinum led him also to excise the transverse processes from the second down. He also injects the inferior cervical sympathetic ganglion with kerocain to avert the sudden alarming drop in blood-pressure and increase in pulse rate which occurs when manipulating the neck of the second rib and transverse process. The anaesthetic used is evipan and a small amount of chloroform vapor. The details of the operation vary according to conditions. The after-treatment is directed to encourage bucket-handle collapse and correct spinal curvature and when the operative wound has healed an elastic web belt is fitted and worn until bony reunion is complete. The tendency to spinal curvature is most marked in the upper dorsal region, with convexity toward the operated side. As soon as the stitches have been taken out, the patient is encouraged to lie on the operated side with two firm pillows under the chest and only one under the head. This correction treatment must be persevered in until bony regeneration is complete. The tendency to upper dorsal and lower cervical kyphosis is combated by not pushing the head forward on the pillows. A summary of 8 cases consecutively operated on at High Carley Sanatorium, Wales, is given, with roentgenographic reproductions.—*The Technique of Thoracoplasty, H. M. Davies, Brit. Jour. Tuberc., January, 1937, xxxi, 3.*—(*A. P.*)

Thoracoplasty Results.—One hundred and fifty cases of completed routine paravertebral thoracoplasties are reviewed. Each of these patients fulfilled the following requirements: (*1*) unilateral caseous pneumonic tuberculosis, (*2*) preoperative positive sputum, (*3*) no active tuberculous laryngitis, (*4*) no preoperative existing pneumothorax or effusion, (*5*) a distinctly visible cavity on a posteroanterior roentgenogram, (*6*) survival for at least four months following the completion of the thoracoplasty, (*7*) persistently negative sputum for at least four months following the completion of the thoracoplasty. The lung field was divided into six areas by means of a vertical line which divides it into inner and outer zones and two horizontal lines, one at the fifth transverse process and the other at the level of the eighth intercostal space at the spine. The six zones thus established are designated the upper outer, the upper inner, the middle outer, the middle inner, the lower outer and the lower inner. Cavities in the upper outer area can be most readily closed by means of thoracoplasty; of 44 cases with such cavities, 42 (95.5 per cent) were closed and the sputum rendered negative. More medial and lower cavities are far less readily closed.—*Results of Thoracoplasty for Caseous Pneumonic Tuberculosis with Relation to Size and Location of Preoperative Cavity, P. N. Coryllos & L. A. Hochberg, Quart. Bull. Sea View Hosp., July, 1937, ii, 349.*—(*A. A. E.*)

Thoracoplasty in Pulmonary Tuberculosis.—With due regard for the surgeon's ability, the ultimate results of operation depend on proper selection of cases, which should be done jointly. The aim of all treatment is to facilitate natural healing by fibrosis. In the group here considered, relaxation or collapse of the lung is necessary to obtain healing with cessation of sputum. A satisfactory pneumothorax is the best method and should be tried first in most cases subjected to thoracoplasty. The latter procedure is irrevocable and is not indicated in the acutely spreading case which reacts so well to collapse by pneumothorax. Livingstone believes the eventual operative technique will aim at a selective collapse of the diseased area, leaving healthy lung to function, yet closing cavities satisfactorily and with less shock. He agrees that a unilateral tuberculous cavity, even if dry, should be closed by some method, as the outlook is particularly grave in those who must earn their livelihood. Statistics as to results are cited from various sources, including Sellors, Archibald (3 groups), Gravesen, and the Brompton Hospital. Livingstone believes that proper selection of cases by the physician should cut the mortality from heart failure and contralateral extension of disease and that he should be able to estimate the general reserve, the specific resistance, and the best time to operate. He also subdivides cases under three groups, as to indications: (*1*) ideal: cases with unilateral disease. These are again subdivided into four subgroups, according to type of lesion and presence of pleural complications. (*2*) Definitely indicated: These are also subdivided into four subgroups, according to the presence of various factors or complications. (*3*) Doubtfully indicated: Subdivided into two groups, acute spread in longstanding

fibrotic lung despite absolute bed-rest and with minimal contralateral lesion; similar contralateral spread, with failure of pneumothorax and quiescent fibrotic lesion in other lung. This last group has the highest mortality, but occasional brilliant results are seen. An afebrile ambulant patient is obviously a better risk than the reverse. The temperature, pulse and weight chart should be considered as well as the chest signs, also age, type and mental make-up. Associated serious diseases, for example, diabetes, asthma, nephritis, and active tuberculosis elsewhere, are usually contra-indications. Serial roentgenograms are the most valuable single method of following the progress of the local disease. Blood sedimentation rate, in the absence of severe anaemia or other infections, is a fairly reliable index of disease activity, especially if repeated at intervals. Houghton's index, based on work and observations at Colindale, is computed from the von Bonsdorff count of nuclei, the differential leucocyte count and the blood sedimentation rate. It would seem to be a valuable method. Vital capacity determinations are tedious but bear a definite relation to tuberculous activity, as shown by Beaumont. Several experienced clinicians consider these estimations as a more valuable index of progress than the sedimentation rate.—*Thoracoplasty from the Physician's Point of. View, J. L. Livingstone, Tubercle, March, 1937, xviii, 262.*—(*A. P.*)

Thoracoplasty in Pulmonary Tuberculosis.—When the disease is of a predominantly fibrotic type good results are generally obtained with any form of collapse therapy. Although predominantly exudative forms may respond well to some measures thoracoplasty is likely to prove disastrous. There is a large group of cases for whom the operation offers the only prospect of cure and yet in each case it may be difficult to decide whether the productive or exudative form predominates. There is a vast difference between collapse of a lung by introduction of fluid, gas or other material between it and the chest-wall and that obtained by plastic operations diminishing the capacity of the hemithorax. In the first instance the lung is also put at rest, in the latter there is no real immobilization but often the converse. The principal requirement of a fibrotic lesion is a tendency to fibrotic retraction, which is facilitated by thoracoplasty, while an exudative lesion requires rest and supplemental care until fibrosis develops. Splinting by air, oil or wax may induce an exudative lesion to heal but thoracoplasty exposes it to detrimental traumatic factors. Maurer and Rolland emphasize, among others, that surgical collapse is not promising for lesions exhibiting no spontaneous retractile tendency. Indeed the outlook for such cases is so grave that further methods to increase general resistance or promote fibrosis are being investigated. Sauerbruch and Schlaepfer have found marked fibrosis to follow ligation of the pulmonary artery and Kirchner and O'Shaughnessy have obtained encouraging results by ligating the pulmonary vein. The ideal type of case for thoracoplasty, as Sauerbruch pointed out over twenty years ago, is a chronic unilateral fibroid or fibrocavernous lesion. In 1914 he reported a series of 122 cases with only 3 operative deaths and 70 to 80 per cent permanent cures. Pyopneumothorax is an urgent indication for thoracoplasty, which can safely be divided into stages. If secondary infection is established, preliminary drainage must be done to combat toxaemia; later an extensive thoracoplasty will be necessary to prevent amyloid disease and to obliterate the sinus. This is far safer and preferable to the Schede type of operation. The standard paravertebral operation is supplemented by extensive anterolateral rib resection and any small residual cavity can later be laid open and allowed to heal from within out. Cases with combined fibrotic and exudative lesions, usually apical, require special and careful consideration. Mason's practice is to remove a portion of an upper rib through a paravertebral incision and then attempt an extrapleural pneumonolysis by digital insinuation. If successful, collapse is maintained by plombage, otherwise an upper thoracoplasty is completed, removing only about two ribs at a time with, if necessary, long intervals between stages. Application of Zenker's solution on gauze strips to the rib bed for four minutes will greatly delay bony regeneration. Where a "contra-selective collapse" is obtained by artificial pneumothorax this should be continued until the apex is collapsed by thoracoplasty. The desirability of diminishing the chest capacity prior to termination of a successful pneumothorax is worthy of consideration in certain cases. Patients with large solitary cavities, at least half of whom die within two years if untreated, are a special problem. Preliminary cavity drainage is to be considered, subsequent improvement being sometimes amazing, despite the occasional persistence of a small sinus after obliteration by thoracoplasty. Even bilateral disease may require active surgical intervention and extrapulmonary lesions are not necessarily a contraindication. Laryngeal and intestinal tuberculosis are known to have cleared up and tuberculous kidneys have been success-

fully removed at a later time. A neglected group is that where a standard thoracoplasty has been done but, despite good general condition, bacillary sputum continues. All cases where this occurs after six months need careful investigation, as usually under the collapsed ribs there persists a small but active cavity which must be freed from the adjacent dense scar. Overlying ribs must be removed and sometimes a paraffin fill inserted. The new method of tomography promises help in localizing these cavities. An uncomplicated and gradually induced artificial pneumothorax, with retraction toward the hilum, gives the best collapse. Thoracoplasty should try to emulate this. Mason prefers to remove the upper ribs first. Rib resection need not always be done paravertebrally. Monaldi advocates a lateral thoracoplasty for midzone lesions. Maurer of Paris added removal of the transverse processes of the upper vertebrae to permit added collapse mesially and Semb of Oslo introduced "extrafascial apicolysis," detaching the pleura from the dome and giving added vertical collapse. Complications include shock, haemorrhage, air embolism, sepsis, generalized emphysema, injuries to pleura or nerves, thrombosis of subclavian vein, asphyxia, atelectasis, postoperative pneumonia and "drowned lung." Shock seems to occur in proportion to the amount of exudative change present in the lesion and is also related to the change in size of the chest. Davies and Edwards think there is some advantage in infiltrating the region of the stellate ganglion and upper intercostal nerve trunks with local anaesthetic. Haemorrhage is rarely serious but the cut end of the first rib may tear the subclavian vein if left exposed. Cyclopropane may give rise to profuse oozing and is not favored by Mason for this reason. Sepsis may be generally avoided or minimized by careful technique. Interference with the fascial blood supply by too much stripping should be avoided. Necrosis of the aponeurotic fascia of the back is especially formidable. Dissemination of disease after operation is a common complication when there is present a large cavity with a fluid level or when exudative disease preponderates. If this occurs between operative stages they must be, for the time at least, postponed or abandoned. Atelectasis is probably more frequent than has been thought. It is probably due to occlusion of a bronchus by tenacious secretion. Sufficient coughing and expectoration must be facilitated by relief of pain and firm pads or strapping to the chest.—*Thoracoplasty in the Treatment of Pulmonary Tuberculosis, G. A. Mason, Tubercle, March, 1937, xviii, 255.—(A. P.)*

Thoracoplasty in the Sanatorium.—Since many institutions which care for tuberculous patients are located at a great distance from centres where thoracic surgery is being done, it is necessary for these institutions to add surgical procedures to their armamentarium if they are to treat their patients properly. It is also to the advantage of the patient to have surgery done where he can be observed by men who have known him before the operation. In 180 thoracoplasties performed on one hundred consecutive patients with pulmonary tuberculosis at Boehne Tuberculosis Hospital, Evansville, Indiana, the operative mortality was nil. Analysis of the cases shows that twenty-four were classified as moderately advanced and seventy-six as far advanced. Nine of the patients are deceased over a four year period, three of these deaths being definitely nontuberculous. Of the living patients, five have no activity, twenty-seven are on limited activity and fifty-nine are working. Other procedures, such as pneumothorax, phrenic operations and paraffin plombage, were used when indicated. Complications consisted of pneumonic consolidation on the operated side, bronchogenic spread to the contralateral lung, mediastinal shift and injury to the bronchial plexus. There was delayed healing of the skin in fifteen cases. There was one pleuro-oesophageal fistula with massive empyema. The anaesthetic used was cyclopropane. Two patients required transfusion. Patients were not considered proper subjects for thoracoplasty unless they had had six months to two years of bed-rest with or without other collapse procedures. It is important that if one type of collapse therapy is found to be ineffective, some other procedure should be substituted for it or supplemented to it, and not hold to one type until the opportune time for another procedure has passed. Thoracoplasty should be used when there is a chance of obtaining satisfactory results and not as a last resort.—*Thoracoplasty within the Sanatorium, Paul D. Crimm, Darwin M. Short & Clarence S. Baker, Surg., Gynec. & Obst., September, 1937, lxv, 357.—(H. W. H.)*

Roentgenograms following Thoracoplasties.—Many thoracoplasties are now being performed with the result that workers in the field of tuberculosis are called upon to interpret X-rays of these patients with increasing frequency. Therefore, an attempt is made to correlate the surgical procedure and the postthoracoplasty roentgenogram. The three stages with the roent-

genographic findings are considered in order. The first stage consists of the subperiosteal resection of the upper three or four ribs, beginning as close to the vertebral margins as possible, and leaving only a small anterior portion of the third and fourth ribs. Occasionally parts of the transverse processes are also removed. In cases where the lung is adherent mesially preventing satisfactory collapse, the lung may be peeled away from the surrounding structures producing a collapse that is equal to or even greater than that obtained in routine thoracoplasty. The X-ray film, immediately after operation, reveals absence of all of the first four ribs except the stumps of the third and fourth which appear drawn backward. The entire upper thorax in the operated area is narrowed. The transverse processes may appear irregular due to surgical removal. The lung is drawn downward and inward, appearing atelectatic, with the apex at the level of the third or fourth interspace. The cavity, if visualized, appears compressed conforming to the general collapse of the lung. There may be some displacement of the mediastinum toward the contralateral side. Considerable shift of the trachea to the opposite side may occur, but there seldom is any change in the size of the lumen. When the trachea has been retracted to the affected side preoperatively because of pulmonary fibrosis, the surgical collapse may restore it to its normal position unless adhesions prevent this. The greatest shifting of the trachea occurs following resection of the first four ribs. The diaphragm may be depressed. A scoliosis of the upper dorsal vertebrae with the convexity toward the operated side is present. This may be accompanied by some anterior rotation of the lower cervical and upper dorsal vertebrae. The scapula and clavicle are prominent but show no change in position. The sternoclavicular joint appears widened due to the rotatory scoliosis. As a result of the surgical trauma and dead space formed, air and fluid collect in the soft tissues posteriorly producing configurations that may be confusing. Air pockets may simulate cavities and sharply outlined pockets of fluid, some showing a fluid level, may appear as encapsulated fluid in the pleural space. Roentgenograms immediately following operation should not be taken as showing the final result of the partial thoracoplasty for further changes occur and cavities apparently obliterated may be clearly seen when the surrounding tissue reaction has cleared. Air is absorbed fairly rapidly but fluid may remain requiring removal during the next stage. Barring contraindications, the second stage is performed three weeks after the first stage. The resection is carried down to and usually including the seventh rib. Large segments are removed starting close to the vertebrae sometimes including the transverse processes, and extending around past the anterior axillary line. In the postoperative roentgenogram the rough anterior segments of the fourth to seventh ribs are seen, the transverse processes may be absent and there may be evidence of beginning bone regeneration in the area of the previous operation. The lung, appearing more atelectatic than after the first stage, is displaced downward and mesially, the apex being at the level of the fourth or fifth rib. The cavity is diminished in size and a shift of the mediastinum to the opposite side is usually seen. Therefore a more nearly normal position of the mediastinum is observed in cases where there was retraction to the affected side. In left-sided cases some rotation of the heart and a change in the contour of the cardiac shadow may be seen. The diaphragm is depressed and flattened. The scapula appears to be displaced laterally and the entire clavicle is easily seen. The rotatory scoliosis is more pronounced and more extensive especially in the young and those with poor muscular development. Again air and fluid may produce confusing shadows. Frequently the latter must be aspirated to obtain good visualization. Here also, X-ray films taken immediately after the operation should not be considered as showing the final result. There will be some reëxpansion and considerable aeration of the lung accompanied by absorption of the reaction in the operative field. Whether the third stage is performed depends upon the original size and position of the cavity, positive or negative sputum, and the presence or absence of any contraindications. As with the second stage, this should be done before rib regeneration occurs in the previously operated field. It generally consists of the resection of ribs down to and including the tenth. In the roentgenogram following operation the new anterior stumps are seen to be longer than those above, there is a lateral collapse of the lung, some shift of the mediastinum and trachea, pronounced curvature and rotation of the dorsal spine, and the various shadows due to surgical trauma as in the previous stages. Since the collapse produced is from without inward, there is very little dropping of the apex, less atelectasis and only disease in the periphery and lower lung field is greatly affected. Should an apical cavity fail to close due to failure of the lung to drop during the first stages, a radical revision of the upper regenerated ribs is indicated. Careful roentgenological

studies should be made before this is done. The operation is always more extensive than the X-ray would indicate and sometimes pressure packing is required to aid in securing the collapse of a large thick-walled cavity. Following such a procedure, there is definite mediastinal shift, the diaphragm is depressed and flattened, the scoliosis is often accompanied by some kyphosis and the sternum is more prominent. There is, however, less surgical trauma and, therefore, less tissue reaction. The end result of a complete thoracoplasty is the formation of a dense irregular bony plaque outside of the parietal pleura. Later on the mediastinal structures may be pulled back by fibrotic contractures. The hemithorax is narrowed and triangular in shape with the base of the triangle toward the diaphragm. If a thoracoplasty is done following an unsuccessful pneumothorax, the space should be entirely lost or the air aspirated to permit satisfactory collapse which might otherwise be prevented by later absorption of the residual air and reëxpansion of the lung. Routine anterior-posterior films do not always give all the information desired. In such cases an over exposed Bucky film, the double exposure technique of Samson and Gurshon-Cohen or stereoscopic roentgenograms may help to decipher confusing shadows.—*Correlation of Surgical and Roentgenographic Findings following Thoracoplasty for Chronic Pulmonary Tuberculosis, L. A. Hochberg & L. Nathanson, Radiology, August, 1937, xxix, 172.*—(*G. F. M.*)

Cleidectomy in Thoracoplasty.—In 1913 Bérard and Dumarest in attempting collapse of the apex of the lung by the anterior approach resected the inner third of the clavicle as well as parts of the first three ribs. The patient was known to be living and plying a trade in 1926. There was no important interference with the function of his shoulder and arm. Such resection of the clavicle, however, has been held superfluous. Recently Fiolle and Carcassonne have revived interest in the procedure maintaining that cleidectomy favored approach to the ribs by the posterior route and also that it insured collapse of the apex of the lung. The thoracic segment of the clavicle is short, and four to five centimetres of its inner aspect are united solidly to the thoracic cage. It forms the base of the subclavian triangle and covers completely a bundle of nerves and blood vessels as well as the thoracic dome. The cartilage and inner end of the first rib are situated beneath it and resection of the clavicle gives considerable freedom in the anterior approach. Removal of the costoclavicular ligament, however, is of no value, for after subperiosteal resection of the first rib there is no direct attachment between the clavicle and the dome of the pleura. There seems to be no doubt that serious disturbance of the equilibrium of the shoulder can be avoided if there is no interference with the integrity of the muscles attached to the scapula. The operation of Fiolle is done in three stages. In the first a simple resection of the inner third of the clavicle is performed with the subject in the supine position. In the second stage the subject is turned to the prone position. After paravertebral incision from the seventh cervical rib to the inferior angle of the scapula the arm is allowed to fall over the edge of the table. Then the muscle attachments are sectioned. This gives a very large field in which the ribs are easily seen. In the third stage after severing the costovertebral articulations the subject's forearm is flexed on the arm and the hand placed over the lumbar region. This manoeuvre permits a wide and free field for the resections. It has been maintained that the operation is not shocking and can be done entirely under local anaesthesia. The exposure which can be obtained by this procedure for the posterior approach is indeed amazing. Surgeons skilled in thoracic surgery, however, can always remove the entire first rib without this mutilating procedure, but it is not easy. That cleidectomy favors collapse of the apex of the lung is true only of lateral collapse. This has been verified by studies on cadavers. Cleidectomy permits approximation of the mesial aspect of the scapula with the transverse processes of the vertebrae. Without it there still remains a good three fingers breadth of space between the two bony surfaces, but whether such approximation really aids collapse of the lung is a matter for conjecture. The necessity for shifting the patient during the operation, the increased time necessary for it and the use of the saw in the vicinity of the large neck veins might very well upset the equilibrium between the patient and the disease. The function of the shoulder need not be seriously impaired by resection of the inner aspect of the clavicle for operations by the anterior approach. It is quite a different matter, however, when cleidectomy is accompanied by extensive resection of the muscles about the scapula. Cleidectomy therefore should rarely be resorted to, and perhaps only in cases where approach by the anterior route is indicated.—*La cleidectomie, opération complémentaire de la thoracoplastie dans la chirurgie de la tuberculose pulmonaire, L. Bérard, M. Dargent & J. Francillon, Arch. méd. chir. de l'app. resp., 1937, xii 122.*—(*C. L. D.*)

Scoliosis following Thoracoplasty in Children.—Six cases are presented, ranging from 11 to 14 years, where the tuberculous disease was brought under control but considerable deformity of the chest resulted. There was a steady progression of the lateral curvature to an average maximum of 30 degrees. The youngest child in the group reached a deformity of 74 degrees. The cases resemble those seen in anterior poliomyelitis where the intrinsic muscles of the spine are paralyzed or weak on one side and a child, with its most rapidly growing years ahead, on whom a thoracoplasty is performed will almost certainly develop a serious and deforming curvature. Fusion of the spine from dorsal 1 to 12 inclusive is suggested as a method of checking the curvature. If possible, thoracoplasty should be avoided in young children who have not reached their rapid growth period. Some attention might well be directed to the fate of the posterior primary divisions of the dorsal nerves which innervate the intrinsic muscles of the spine.—*Lateral Curvature of the Spine following Thoracoplasty in Children, M. Cleveland, Jour. Thoracic Surg., August, 1937, vi, 595.*—(*L. F. B.*)

Thoracoplasty Results.—Between 1932 and 1934, inclusive, thoracoplasty was recommended for 153 patients, exclusive of those with tuberculous empyema. Eighty-five accepted and 58 refused operation. During the first 3 months of 1936, 114 of the 125 surviving patients were reviewed as to physical and functional status. A case was classified as closed when the sputum was consistently negative for tubercle bacilli, after concentration, for 6 months to 3 or more years, X-ray films were consistent with a healed or retrogressive lesion without evident cavitation, and when there were no constitutional symptoms. The cases were grouped also as "good" and "slipping chronics." Of the 85 operated cases 57 per cent were closed, 9 per cent improved, 6 per cent unchanged, 7 per cent worse, 14 per cent dead, and 7 per cent untraced. Of the 58 patients who refused operation 10 per cent were closed, 7 per cent improved, 14 per cent unchanged, 35 per cent worse, 26 per cent dead, and 9 per cent untraced. Sixty-eight cases were placed in the "slipping chronic group." Forty-two were operated upon with these results in percentage: 43 closed, 14 improved, 7 unchanged, 12 worse, 17 dead, and 7 untraced. Twenty-six refused operation and their present physical status, in percentage, is: 4 closed, 4 improved, 4 unchanged, 42 worse, 35 dead, and 12 untraced. The "good chronic" group consisted of 75 cases. Of the 43 having thoracoplasty 70 per cent were closed, 5 per cent improved, 5 per cent unchanged, 2 per cent worse, 12 per cent dead, and 7 per cent untraced. Of the 32 who refused thoracoplasty 16 per cent were closed, 9 per cent improved, 22 per cent unchanged, 28 per cent worse, 19 per cent dead, and 6 per cent untraced. In regard to the functional status, the "able to work" group excludes all patients under treatment at home or sanatorium, the "well but unable to work" group includes those closed or improved cases who are functionally incapacitated although satisfactory healing has occurred. Of the 85 thoracoplasty cases 47 per cent are able to work, 9 per cent are well but unable to work and 22 per cent are curing. Of the 58 patients who refused thoracoplasty 16 per cent are able to work, 2 per cent well but unable to work, and 48 per cent are curing. Of the "good chronics" operated upon, the functional status, in percentage respectively, is 63, 5 and 14. Of the "good chronics" who refused operation the functional status, in percentage respectively, is 25, 3 and 47. The operated "slipping chronics" similarly classified is 31, 14 and 31. Of the "slipping chronics" not operated upon, the percentages respectively are 4, 0 and 50. In general results, thoracoplasty increased by four times the chance of therapeutic improvement and decreased by two-thirds the possibility of becoming worse. Contrasting figures in the "slipping chronic" group are seven and less than two-thirds. In the "good chronic" group contrasting figures are three and more than two-thirds.—*A Control for Studying the End-Results of Thoracoplasty, S. O. Freedlander & S. E. Wolpaw, Jour. Thoracic Surg., June, 1937, vi, 477.*—(*L. F. B.*)

Paraffin Pack and Thoracoplasty.—For several years cases presenting large apical cavities have been treated by means of an initial paraffin pack which, if the sputum were not rendered negative, was later removed and a secondary thoracoplasty added. This sequence was adopted because the initial pack is less dangerous than thoracoplasty, has a fair chance of closing the cavity and rendering the sputum negative, if it does not close the cavity it reduces it in size and stabilizes the mediastinum so that secondary thoracoplasty may be more effective, and thoracoplasty secondary to a paraffin pack is safer. This plan of treatment has been completed on 16 cases presenting large apical cavities. In 6 cases the initial pack rendered the sputum negative, in 7 the sputum became negative following secondary thoracoplasty, 2 cases were improved and 1 case was worse. In the latter case secondary thoracoplasty was impossible

because of spread to the contralateral lung. Complications met with in this series were: 1 case of postoperative atelectasis of the homolateral lower lobe, 1 case of postoperative pneumonic exacerbation of disease already present in the same lung, 1 case of spread to the contralateral lung, and 3 cases of perforation of the pack and expectoration of paraffin. The first two complications were relieved by complete thoracoplasty. In a second group of 15 cases with similar but less extensive disease and for which thoracoplasty was suitable, 9 were rendered negative by initial paraffin pack, 2 became negative following secondary thoracoplasty, 1 was improved, 1 died of preëxisting extrapulmonary disease and 1 died of nontuberculous lobar pneumonia. In a third group of 13 cases where thoracoplasty was contraindicated most of the cases were improved but none cured.—*Paraffin Pack and Thoracoplasty in the Closure of Large Apical Cavities, J. R. Head, Jour. Thoracic Surg., June, 1937, vi, 491.*—(*L. F. B.*)

Key to Abstractors

A. A. E.: Adrian A. Ehler, Ann Arbor, Michigan.
A. P.: Andrew Peters, Springfield, Massachusetts.
C. L. D.: Charles L. Dunham, Chicago, Illinois.
E. M. J.: Edna M. Jones, Northville, Michigan.
G. F. M.: Gertrude F. Mitchell, Detroit, Michigan.
G. W. W.: George W. Weber, Albany, New York.
H. W. H.: Harlon W. Harrison, Northville, Michigan.
J. S. W.: J. Stanley Woolley, Loomis, New York.
L. F. B.: Lauren F. Busby, Northville, Michigan.
M. B. L.: Max B. Lurie, Philadelphia, Pennsylvania.
W. A. Z.: Wm. A. Zavod, Valhalla, New York.

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